# GREEN WALLS AND TEXTILES

**Maria Bostenaru-Dan**[1]

[1] *"Ion Mincu" University of Architecture and Urbanism (ROMANIA)*
*maria.bostenaru@iaim.ro*

**Abstract**

The connection between textile and architecture is usually investigated from the point of view of textile as a material of (tensile) structure. We will look at the other side: outgoing from the architecture theory which differentiates between the load-bearing structure and the ornament carried on this, the textile is a support of the second. Either as metaphor (the non load-bearing wall becomes for Semper "Gewand") or literally, when plants are printed or grow on the textile wall. We can find at least inclined surfaces also in the landscape, and will deal with the employment of textile for growing plants on such derelict sites as well. Both analysis are basis for how it can be dealt with in design projects.

**Keywords**: architecture, landscape architecture, felt, architecture theory, vegetation

## 1 INTRODUCTION

In this paper we deal with textile as cloth for architecture and landscape architecture. The structure of the building or the earth itself are covered with plants carried by a textile structure, which is however, the structure of the ornament and not load-bearing. We will perform the literature review as we identify the typologies we are dealing with. They span from the interpretation in philosophy as applied to architecture, over architecture theory, to more technical aspects as the connection between biology and architecture, as nature transposed to decoration of architectural surfaces, in drawing and 100 years later in itself. The application of this analysis should be better intervention on sites struck by natural disasters and left derelict.

## 2 TEXTILE AS ARCHITECTURE AND LANDSCAPE ARCHITECTURE SURFACE - TYPOLOGIES

### 2.1 Textile paradigm

Deleuze (1980) promoted a philosophy theory in which he distinguished between the smooth and striated space, between nomad and sedentary, among others in the paradigm of the cities, which are smooth to be reconfigured. One of the paradigms to differentiate what the textile paradigm (technological model), in which he differentiated between flat, the felt and striated, the woven. Something needs to be flattened in order to be striated again. We will see in this contribution how the flat, the felt, is support for plants which used to be printed on the woven, which is a new employment of Deleuze's theory.

### 2.2 Wand und Gewand (wall and cloth)

Theories of architecture around 1900 experimented with the differentiation between the structure of a building and its ornament. Boeticher analysed by Schulz (1999) distinguishes between ornament and constructively needed structure, the first being symbolic artistic shape,

the decoration illustrating the material core shape which bears the function (the second) or not. This latter issue concerns a sincerity aspect in architecture (Bostenaru, 2005).

The preoccupation for structure appeared as functional division, with the appearance of light systems, was not anymore the same with the load bearing system. The first one concerned was Viollet-le-Duc, who sought after a 'tectonic' architecture, focusing on the art of construction, as since the late nineteenth century, the concept of space has been an integral part of both thinking and evaluating architecture. Later on, Kenneth Frampton dedicated a book to analyse this concept of "tectonics" in architecture, the expression of structure up to the detail.

The roots set by Viollet-le-Duc in the 19th century were fruitful in the architecture theory of Gottfried Semper. Gotfried Semper postulated the elementation of the construction following the principle of the ancient cottage: foundation, wall and roof. The innovative part in Semper's theory is the way the wall is seen. In a German play of words Semper connects "Wand" (wall) to "Gewand" (cloth). Gottfried Semper formulated 1834 his 'siding theory' (Moravánszky), according to which 'clothes' for construction materials are only necessary in order to protect these from weathering influences and marked with it important steps toward the Modern Architecture. He never turned his theories to reality, but the Viennese architect Otto Wagner, an architect of Secession (a variant of Art Nouveau, to which we will return) did so. This theory is carried over to the Avant-garde. Adolf Loos protested against the 'lie' in architecture (ornament is crime), and this is the most important victory of the Modern Movement.

But not only Semper was concerned with tectonics and clothing. When turning to the architectural surface, an architect of Arts and Crafts, another turn-of-the-century movement, John Ruskin, thought connections between clothing and tectonics (Chatterjee, 2009).

### 2.3 Textile as support for plants

Textile as such is a material to be ornamented. We visited the Goldberger Textile Museum in Budapest and gathered information about printing of vegetal patterns, particularly flowers. Several interactive items exist: stamps to do the pattern, transparent slides to superpose different colours, and do your own patterns in a play of pins. Also the multimedia component is present, being able to throw a pattern on a certain cloth.

This behaves no different in the case of buildings. The architectural surface becomes support for vegetal patterns. This patterns can be painted or done out of roof tiles (as usually in Art Nouveau, Fig. 1), be reliefs, or today projected with multimedia (media facades, Fig. 2) or even created by living plants in living walls, sometimes lighted (Fig. 3). Less spread alternatives which form scenographic installations are projections of plant shadows or contemporary reliefs, as well as interactive museum installations such as interactive plant growing or moos walls (ZKM, Karlsruhe, see Bostenaru, 2014). From all these cases plant drawings on tapestries in the interior walls of Art Nouveau (Fig. 4) as well as living walls have textile support, not only textile metaphor.

But we will analyse also the insertion of plants on textiles in the landscape, in integrating derelict sites.

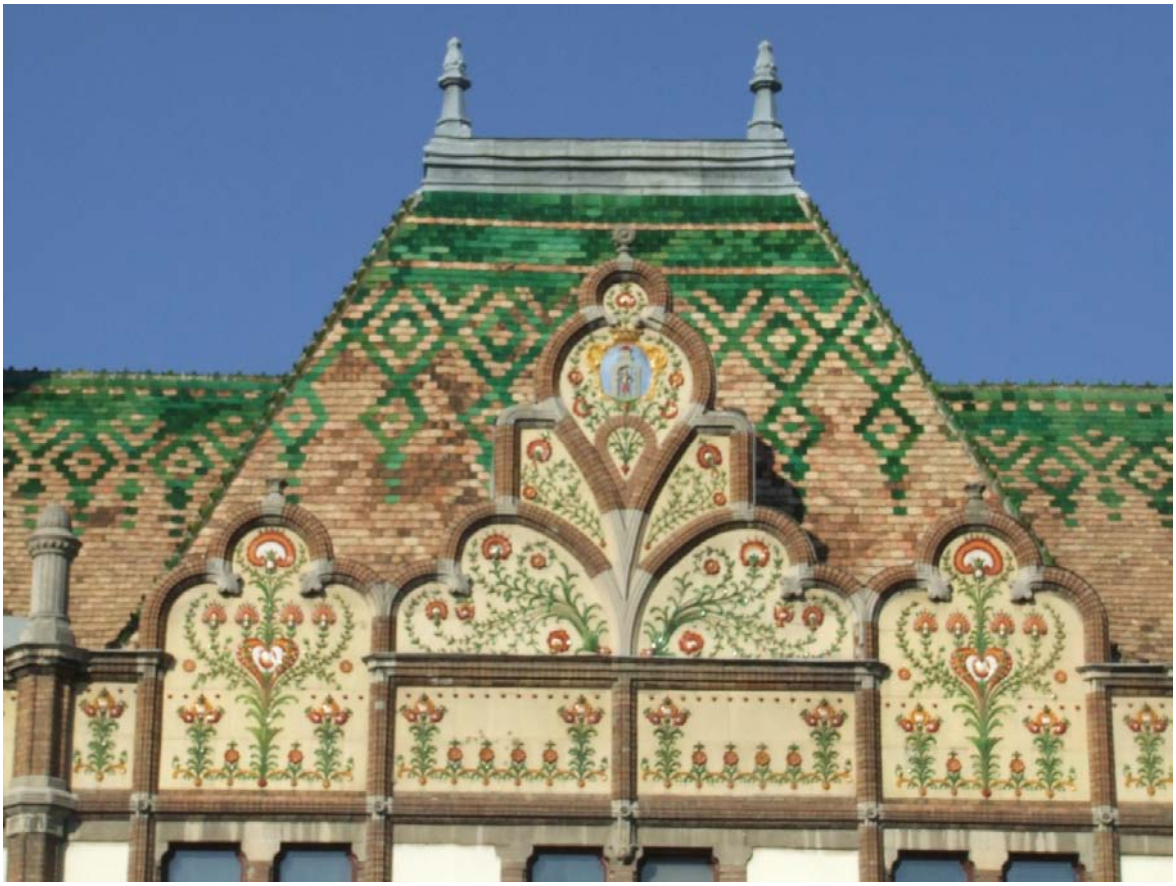

Fig. 1. Roof tiles inspired from carpets in the townhall of Kiskunfélegyháza, Hungary, 1909. Photo: M. Bostenaru, 2006


Fig. 2. Media projection on the façade of the Christmas Market in Bucharest. Photo: M. Bostenaru, 2013

Fig. 3. Caixa green wall in Madrid by night. Photo: M. Bostenaru, 2014

### *2.3.1 On buildings*

Following the theory of Semper and Ruskin, architects of Art Nouveau at turn-of-the-century, and some of the architects today, tried to transpose the horizontal pattern on which we step in the vertical cloth of the building: vegetal models of mostly flowers or plants related to flowers creating a similar pattern.

The turn-of-century Art Nouveau marked, together with the newest discoveries in biology (Gamwell, 2003; Martin, 2009), a turn towards nature in shaping of buildings. Drawings and sculptures of plants decorated facades, doorways, fences etc. Sometimes, in the interiors, this decoration used the traditional support of the textile tapestry (textile weaving applied on walls), sometimes in the exterior the roofs displayed motives inspired from Oriental carpets, as it was the case in Hungary (Fig. 1). Particular about this development is that any type of exotic plant could be integrated, since plants were drawn. Today the correspondent for this direction is the media façade. The patterns are projected on, mostly exterior, facades.

Fig. 4. Art Nouveau tapestry in an interior in Milan. Photo: M. Bostenaru, 2011

Green walls are when greening happens vertically, on the façade. Felt based green walls are called living walls. Although the patent is older, the French Patrick Blanc was the one to introduce it at a large scale. He was inspired by plants growing on stone, with water only, in Vietnam. Hence, plants can grow with water and vitamins on felt based material. For this felt based material a non biodegradable geotextile is being employed. Several studies dealt with differentiating the kinds of living walls from their technical, not their artistic point of view. Perez et al (2011) classifies green vertical systems into green facades and living walls. Green facades are considered in this context to be extensive green, and sub-classified into traditional and double-skin or green curtain (modular trellis, wired or mesh structures), or intensive green, which are perimeter flowerpots. Living walls are considered to be intensive green and in this category fall panels and geo-textile felt. According to Francis and Lorimer (2011) in case of green facades the plant grows at the base of the wall, while living walls are designed like vertical green roofs, with the support parallel to the wall. This way, although bound to climate, the variety of plants is larger than just climbing plants, and patterns from different plants can be created (Fig. 3). According to Ottele et al (2011) the support of the living wall system can be two-fold: either a system based on planter boxes (filled with potting soil), or a system based on felt layers. The first one we saw at an outdoor wall in Budapest and it required for a certain kind of plants which keep the earth with their roots. Wong et al (2010) goes further with the sub-classification of living walls in what was investigated in the paper:

- Modular panel, vertical interface, mixed substrate;
- Grid and modular, vertical interface, mixed substrate;
- Modular panel, vertical interface, inorganic substrate;
- Planter panel, angled interface, green roof substrate;
- Framed mini planters, horizontal interface, soil substrate;
- Vertical moss-tile, vertical interface, inorganic substrate;

- Flexible mat tapestry, horizontal interface, soil substrate;
- Plant cassette, horizontal interface, soil substrate.

We can see in this array of choices that there are modular (mixed or geotextile substrate) and planter panels (soil substrate), but also the employment of the moss wall experimented by Olafur Eliasson for an artistic installation (http://www.olafureliasson.net/works/moss_wall.html). Indoor living walls are called according to Francis and Lorimer (2011) biowalls. Alternatively to both designs a green wall producer in Romania proposes pockets which contain the felt and vitamins from which plant grow like in green facades. Both climbing plants and this system have the advantage for interiors that they can build transparent separation walls. Such transparent walls can be employed also on propping system to revive areas after disasters, as we will discuss.

### *2.3.2 In landscape*

The carpet with flower decorations lays on the floor of the house as does the field. For this part of the paper we will go outside the building, in the landscape. Former industrial sites are being converted to nature by laying an invisible carpet of textile on which plants grow instead of being drawn. Two case studies were considered, the ash and the garbage domes, which connect to the domes on the buildings – as a variant of green walls, which we will see in the discussion Makovecz employs. Unlike on buildings, when connected to Mother Earth, a biodegradable geotextile is to be employed.

The first example is a project of us, for the garbage hill in the port of Karlsruhe. Karlsruhe is a city on the Rhine, but due to flood hazard the city grew at a certain distance from the river, the coastal front not integrated in the urban development. Instead of building at the river, the river became place of the harbour, the second largest internal one in Germany. Industrial areas are now shrinking. Aim of the project, by Andreea Ciobanu and us, as student of the University of Karlsruhe in 1998, was to bring the city back to the river. Now such an approach is aim of the programme for the 300th anniversary of the city in 2015. Connecting water to green leads to so-called blue-green infrastructure. The turn of the millennium marks the ecological re-win of rivers, and, due to technological development, the industrial area can be concentrated and residential areas integrated. Motto of the project was nature and city, the North was reserved to Nature, the South to the City (Stadt). Between them, a waste deposit, proposed to be transformed into a “green hill” (Fig. 5). Similar conversions have been performed in the IBA Emscher Park exhibition, also in Germany, in the Ruhr area. Some of them were coupled with artistic projects. The technical details have been developed in Romania for ash dumps, as we will see.

Studies were made by Siminea and Bostenaru (2000) on the conditions in which plants grow on former waste deposits if supported by intermediar layers of a geotextile. The authors described characteristics of the geotextiles, together with the technologic process of obtaining them. Experimental results were obtained in laboratory and on field for use on waste deposits in comparable conditions in Romania. The geotextile is also usable for ash deposits such as those in the Ruhr area to which we referred before.

## 3 APPLICATION

Earthquake protection is a long term goal. Technical prerequisites are well known, implementation is stagnating. In both seismic retrofit as well as in seismic resistant new construction, in this particular case in frame of reconstruction efforts, other aspects of sustainability have to be incorporated.


Fig. 5. Modell of the Rhine reintegration to the city of Karlsruhe project. Photo: M. Bostenaru, 2006.

For example, in the C.A.S.E. project in l'Aquila solar panels were used. This enhances the acceptability of the measures. Geotextiles are being used also in temporary reconstruction after earthquakes (for example towers of churches in l'Aquila, Italy) and the connection between the types will be investigated. There isn't much research on the contribution of architecture to disaster management. Emergency architecture is such a field, and there are groups of architects for emergency housing (ex. in France), but research is scarce. Emergency housing is an interdisciplinary field, where architecture can excellently contribute. Since the arrival of the Modern Movement, architecture was concerned with the employment of new materials for dealing with social challenges such as industrial production. Today the challenge is dealing with environmental problems. Resilience to natural hazards is such a problem, but the larger frame of reaction to climate change has to be kept in mind. Geotextiles are being employed in stabilising earth in order to be able to plant on oblique or even vertical surfaces. Mostly they are employed in large landscape, such as ash or garbage deposits, or on river sides, but an employment on building scale is possible. Such, geotextiles should be also employed in l'Aquila to stabilise inclined ground around the housing in this mountainous area. Geotextiles have been mainly developed for infrastructure use; uses on building scale are rare. Such an example is the use of geogrids for seismic reinforcement by Ramiro Sofronie, at national level. These kind of products have been launched with the 1980s and their potential, as with any new materials, hasn't been researched enough. Green walls allow integrating the parcels remaining empty after the collapse of a building through reusage as Pocket Parks. Thus way the destructive impact of an earthquake becomes an occasion for urban restructuration, providing green in urban areas without having the negative urban image of brand walls. It is possible to integrate the elements also with propping systems. Pockets Parks can be created also on the top of underground parking area of buildings.

Our final aim is to employ green walls and green roofs for emergency housing purposes. An innovative material and implementation system was designed and will be presented. Green roofs and walls are helping also in coping with climate change. They are also assuring the link with tradition, as shown in Imre Makovecz's organic architecture (Fig. 6), and thus assuring the "heritage habitat" in order to socially integrate the new development in the "heads of people". Elements such as green roofs belong to the vernacular heritage of some countries (ex. Faroe islands), and they have started to be introduced in modern organic architecture. The architecture of Imre Makovecz who recently passed away is such an example, with the inclined sod roofs it includes. Since Imre Makovecz's architecture is an example of traditional elements in the modern landscape, a relationship shall be done to the fact that traditional housing tends to perform better in disasters, due to the local culture. The new material allows for different plants than traditional sod-roofs, as those from Northern Europe. Thus the variability dictated by the ecological city is greater. We reviewed the seismic safety aspects of these added features of construction, which are the requirements on the implemented elements, modular or not, and the possible positions in the section of the building (roof over the building or parking).

Biodegradable geotextiles used for green roofs and inclined surfaces are not suitable for some of the applications in the project, such as vertical green walls to be integrated in emergency housing or in pocket parks on empty plots. Romania will be prepared better to react in case of a possible disaster, having ready projects for emergency housing which will permit sustainable regrowth.

Fig. 6. Green dome by Imre Makovecz in Visegrad. Modell in the 2014 exhibition at the opening of Vigadó. Photo: M. Bostenaru, 2014

Plants integrated in a biodegradable geotextile which keeps the earth together until the roots of the plants grow enough. This would be an alternative to current sod roofs, allowing for plants of different colour to be integrated within the architecture object (greater plant diversity as Francis and Lorimer, 2011, affirmed), not just green grass, as in case of living walls.

## 4 CONCLUSIONS

The role of green walls, natural or artificial, cannot be seen separated of that of ornament in architecture. For this reason we analysed the architecture theory approaches to ornament, particularly to wall ornament, although the metaphor of carpet for example has been employed also for roofs, as the greening also does. This approach starts in the 19th century, but the late 20th century saw a new philosophic interpretation, in the flat and the striated. The textile paradigm differentiates between felt and weaving, however, in our interpretation these are both striated in case of building ornamentation, flat being the architecture of the Modern Movement, lacking ornaments. But the theory of felt and weaving is still valid when we see that the weaving bears the artificial drawn plants, while the felt is basis for growing, which can be put also in connection with Deleuze's theory for the settlement.

For our own design project, we tested the applicability of such approaches in case of emergency housing. Research cannot be a goal in itself, its applicability is important.

## ACKNOWLEDGEMENTS

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# SUPREMATISM BECOMES ARCHITECTURE

**dr.arh. Letiția Bărbuică**

*"Ion Mincu" University of Architecture, Bucharest (ROMANIA)*
*Head Made Architecture, Bucharest (ROMANIA)*
*letitia.barbuica@headmade.ro*

## Abstract

Hadid was always "wanted to open a door to a world that had yet to be invented"[i] hence her commitment to innovation and experiment. The paper traces her beginning in exploring the new and ignoring any architectural precedents, starting with her diploma project (1977).

The interest in Suprematism is marked by her experimental diploma project in which she transforms Malevich's *Architecton* (1923) into a functional bridge - to connect the two embankments of Thames, over the Hungerford Bridge. The report of her professor at the time, Rem Koolhaas, is eulogistic as he envisage his student incredible trajectory within the world of architecture: "Now she is a PLANET in her own inimitable orbit. That status has its own rewards and difficulties: due to the flamboyance and intensity of her work, it will be impossible [for her] to have a conventional career."[ii]

Thus, starting with her diploma project Hadid transforms Suprematism into architecture. Suprematism becomes architecture. A series of connections, a constant pursuit that traces back to Suprematism become apparent in her architecture even up to 2011 with her CMA CGM Headquarters Tower in Marseilles.

Suprematism is the the promoter of abstract visions and Malevich entails the brake from any mimetic forms, from any inspiration related to nature. To the mathematical mind of Hadid[iii] this was very seductive. Her interest in Suprematism might not be always too explicit in her projects and buildings, but the significance of this art movement in her own architectural world is shown in an exhibition that she organised for Guggenheim Museum, NY, in 1992: *"The great Utopian: The Russian and Soviet Avant-Garde 1915-1932."* The exhibition is a tribute to Malevich. In 2010 she organised yet another exhibition in Zurich where she juxtaposed her buildings on the background of suprematist creations by Ilya Chashnick, El Lissitzky, Kasimir Malevich, Alexander Rodchenko and Nicolai Suetin, highlighting once more the invaluable vein of her architecture.

Her approach to put together architecture and art – 50 years old Avant-garde art – is unique. By doing so Hadid is recovering the emotional and oneiric touch that architecture lost during Modernism in exchange for utility, full readable use of the building, the so called honesty of the building. Hadid dared to challenge the architectural culture in a similar way in which Suprematism challenged the institutional art of the time. And by doing so she liberates architecture and the architectural image.

The continuity of her unparalleled approach and the time span of over 35 years of work in this architectural and art laboratory proofs not only the solid vein that she had found in Russian Avant-garde, but also her resilience and persistence in her architectural research. Thus we can say that Hadid created, based on an invariable concept-base, an incredible diverse and variable architecture.

**Keywords**: Suprematism, Hadid, Malevich, research through design, experiment, *planit,* invariable concept.

# 1 THE SUPREMATISM BRIDGED

Zaha Hadid was born in 1950 and studied at AA in London- the most progressive architectural school at the time. She was a trend setter since her childhood as she herself disclosed: “From when I was ten I wore funny clothes, I said strange things. It wasn't as if I deliberately tried to be outrageous – I was outrageous....”1] This is the psychological basis on which is built her pursuit of INNOVATION AND EXPERIMENT in architecture. ”I wanted to open a door to a world that had yet to be invented”[2], she is telling us and it is exactly what she has done starting with her diploma project in 1977.

Her experimental diploma project in which she transforms Malevich's *Architecton* (1923) into a functional bridge to connect the two embankments of Thames, over the Hungerford Bridge marks the beginning of her interest in Suprematism. The report of her professor at the time, Rem Koolhaas, is eulogistic as he envisage his student incredible trajectory within the world of architecture: “Now she is a PLANET in her own inimitable orbit. That status has its own rewards and difficulties: due to the flamboyance and intensity of her work, it will be impossible [for her] to have a conventional career.”[3]

The hotel project investigates the affinity between Suprematist forms and architectural form and space, as the young Zaha literally takes upon “Malevich's Tektonik”[4] and turns it into architecture.

The Suprematist paintings are abstract rectangular composition, based on black and white and primary colours, mainly, and their main characteristic is that there is no cross reference with the real world. They should have been created as perfect abstractions of the mind with no analogy with the real world what so ever.

The *Architecton* developed this idea one step farther and translated the abstract rectangular forms of the Suprematist into the third dimensions. It was as if, a gradual and differential extrusion of the two dimensional Suprematist drawings transform into abstract three-dimensional models. Fig.1 and fig.2 show the exact similarity of Hadid diploma project and one of the three-dimensional representations developed by Malevich. Formally they are nearly identical and this shows Hadid interest towards an artistic end of architecture, not only a functional one, not only a contextual one.

Golding is explaining about the ***arhitectons*** that they ”...were never practical or functional; and once again they may best seen as messages, designs, blueprints for the builders of the future.” [5]. Still, Malevich himself saw the immediate potentials of his studies to be translated into architecture as he founded a laboratory of architecture, called ***Suprematists Order*** in which he investigated this topic together with his students Suetin and Chashnik. Moreover there is an interesting black and white collage of Malevich, dated 1925, showing a vertical architecton overlapped to a dense urban landscape.[6] He also wrote to one of his friends: „In the spiritual sense, Suprematist paintings and Suprematist Architecture are the same. Sometimes the birth of Suprematist Architecture is linked to the attempt to transfer painterly Suprematism to axonometry.” [7]

One can not escape noticing also the similarity of Hadid early representation of architecture with the above description of Suprematist Architecture; her axonometric, painterly description of architecture for Malevich's Tektonik(1977), Museum of the Nineteenth Century (1978), Dutch Parliament Extension (1979), Parc de la Villette (1983), The Peak (1983), Halkin Palace (1985) fit exactly into Malevich description from the letter to his friend. The Hamburg Docklands (1986) expression and iconography send us directly to Suprematist paintings, which shows Hadid extending Suprematism ideas of composition, form, dynamic and style, to the urban scale.

Is somehow ironic that something started as to be totally disconnected form any utilitarian use or analogy is so directly translated into architecture, and such can not escape the utilitarian role. Malevich imagined and constructed several architecton compositions: alpha architecton, beta architecton and Gota(1923)(see fig.3), a vertical architecton that was first presented at MOMA, New York in in 2013. If one puts in perspective the fact that Chrysler Building was built in 1930 and Rockefeller in 1934 [8] than, Malevich vision on the future of architecture appears very clear and with no doubt .The ***architecton*** can be seen as a visionary laboratory in itself and Hadid opened the dusty door of this laboratory, some 50 years later, and continued the work.

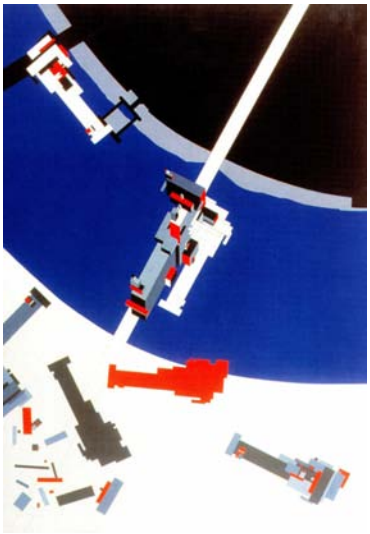

Fig.1
Zaha Hadid diploma project 1977
(http://lebbeuswoods.wordpress.com)

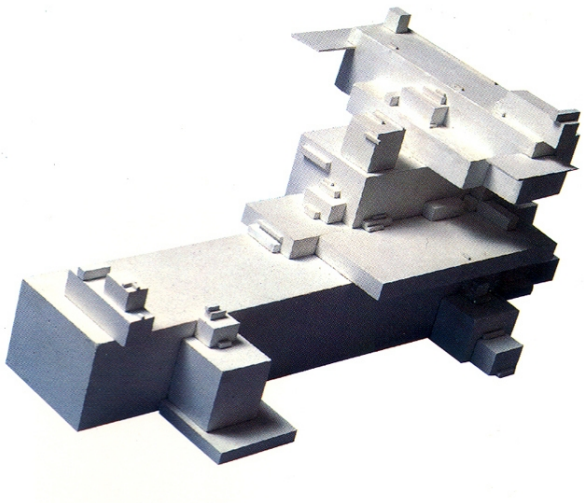

Fig.2
Kazimir Malevich, Arhitecton, 1923
(http://lebbeuswoods.wordpress.com)


Fig.3
Chrysler Building NY, 1930
(http://www.skyscraper.org)

Fig.4
Kazimir Malevich, Gota architekton, 1923
(http://www.moma.org)

## 2 FROM *THE GREAT UTOPIA* TO REALITY

Hadid's interest in Suprematism is underlined by the exhibition she organized at Guggenheim, New York in 1992 : ”The great Utopia: The Russian and Soviet Avant-Garde,1915-1932”, in fact a reverence to Malevich. ”His work allowed me to develop abstraction as a heuristic principle to research and invent space”[9] Hadid explains in an interview.

In 2010 she organised another exhibition in Zurich entitled „Zaha Hadid and Suprematism”[10]. In this show she exhibit her architectural creations on the background of works by Ilya Chashnik, El Lissitzky, Kasimir Malevich, Alexander Rodchenko and Nikolai Suetin making a clear statement regarding the basis of her research in architecture. Still, in the exhibition there is no exact connection between a certain Suprematist work and a

certain architectural piece, rather a connection with their way of thinking, their visual and emotional impact, a narrow cultural context that they have created and from which she extracted a whole new view on making architecture.

In the following pages I will point to some direct connection between exact pieces of Suprematist art and Hadid's architecture in order to make more visible the connections and maybe to disclose a modus operandi.

## 2.1 Planit

Malevich had invented, as part as his volumetric search within Suprematism, a sculpture made by elementary volumes, named *planit.* "The planit will be accessible from all sides for the earth dwellers who will be able to be in it and on the top of it."[11] This description made by Malevich seems to describe Hadid's Phaeno Science Centre. With his eight inverted conical legs the building allows for accessibility from all directions into the building; and the building in it self is a suspended podium where you are simultaneously above and within the space, exactly as Malevich had imagined.

The same idea I found in one imaginary drawing by Cernikov. When having a brief look at the drawing done by him (fig. 5) and the view of the building (fig.6) the resemblance is striking. Even the industrial context imagined by Cernikov matches the urban conditions in which Phaeno Science Centre is placed, at the fringe of the city, near industrial developments. It is very interesting that Cernikov is not mentioned in the 2010 Zurich exhibition, still he obviously had a huge impact on Hadid's work.

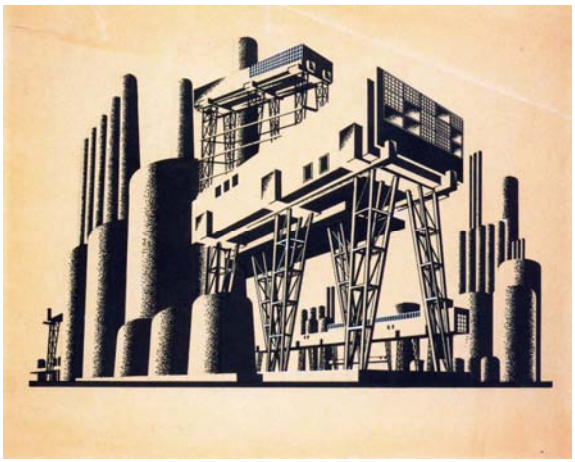

Fig.5
Cherikov, Giant Plant of Special Purpose 1931
( http://thecharnelhouse.org)

Fig.6
Zaha Hadid, Phaeno Science Centre
(http://www.arcspace.com/)

## 2.2 Chernikov

Ila Chernikov was the architect in the group so may be that is more clear to point to his utopian visions and connect them to Hadid's architectural work. They may be expressing in a more architectural way the ideas behind Suprematism.

"Chernikhov always advocated the abstract — abstract from programme, from politics, from trends, from fashion."[12] Hadid, as well, works with abstract volumes and forms that had no connection with the use of the building, do not mirror any politics and are indifferent to trends and fashion as trends and fashions are to be create by the exact architectural model that ignored them. Chernikhov had produced a series of drawings - *Architectural Fantasies*- in which he explore the line directed by Malevich: " a plastic feeling rendered on canvas can be carried over into the space. The artist is no longer bound to the canvas and can transfer his composition form canvas to space."[13]

As much revolutionary as this idea seemed for the artist – the painter- for the architect, to play between two dimensional representations and tri-dimensional forms, is actually part of the basic training. Hence, for Hadid was an instant grasp of the whole procedure providing that the starting point, the two dimensional representation, can earn the status of art.

Browsing through Chernikhov *Fantasies* and *Compositions* similarities with Hadid work are striking.

The dynamic of Bergisel Sky Jump has the dynamic, composition, forms and proportions imprinted from Composition no.16 by Chernikov, as well as the realization of a dynamic volume supported by a single leg type of structure. (see fig.7, fig.8 ).

CMA CGM Headquarters Tower in Marseille (2011) draw one of his characteristic feature – the way the vertical office tower connects, in a very particular way, with the horizontal volume- once again , from Chernikov's Composition no.18, *Vertical and Horizontal Dynamic*. This transition between the vertical and horizontal is a new way of solving this dichotomy that persisted in the high rise building design to which Hadid brings new materiality, an a more sensible approach. (see fig.9, fig.10)

Chernikov's composition no.89, *Combination of curved and straight lines with colour illumination*, is very close to a very recent building design by Hadid – Galaxy Soho Beijing (2012). The horizontal plans of the slabs underlined by Hadid and their changing contour in order to define a curved volume are exactly depicted in composition no.89, as well as the possibility of putting together this type of volumes which was first investigated and proofed viable by his *Architectural Fantasies.* (see fig.11, fig.12)

## 2.3 Composition with red square

Center for Contemporary Art (CCA), Cincinati is an abstract composition of parallelepiped seemingly floating above the street. Is a Suprematist composition in black, grey and white. The volumes are crude, can be perceived also from the interior which is more dynamic because of the skew cuts, parallelepipedic stairs and ramps that connects the floor. Betsky sees in the building a type of ”anti-gravity recalling Magritte's suspended work.”[14]

For me is more obvious connected with Suprematist abstract compositions, that do not communicate any content. I connected this building rather with Ilya Chashnik's imagery, sharing the same strangeness that comes from the apparent mysteriously floating forms. Looking at Chashnik's *Suprematist Composition* and the facade towards Walnut Street of the CCA building the similarities are striking. (see fig.13, fig.14). The dynamic of both composition is very subtle: the play of shape and color of the painting are continuously and slightly coming back and front as the sculptural volumes of the gallery do. The slightly rotated angle of the rectangles bring a floating character to the composition, translated into architecture with the game of transparent, opaque and underlined by night lighting of the volumes. Interesting as note here, the detail of the intersection between the entrance horizontal level and the main vertical (dead) wall of the exhibition that carries the stairs and ramps, in a similar way, at the smaller scale, with CMA CGM Headquarters Tower, discussed before. It is about the spatial fillet of a right angle.

Fig.7
Zaha Hadid, Bergisel Sky Jump, 2002
(http://archrecord.construction.com/)

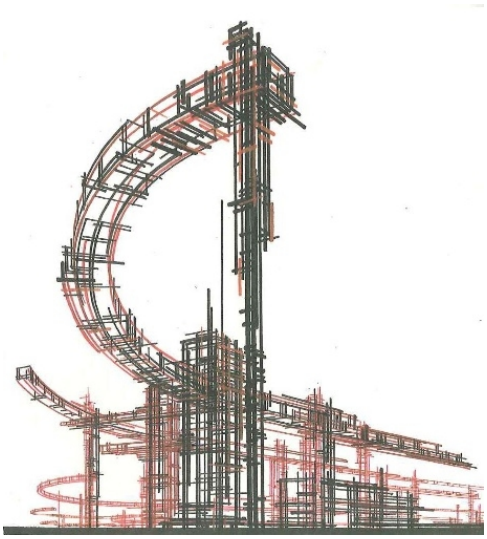

Fig.8
Yakov Chernikov, Composition no. 16, 1929-33
(http://www.bdonline.co.uk/)

Fig.9
Zaha Hadid, CMA CGM Headquarters Tower, 2011
(http://www10.aeccafe.com)

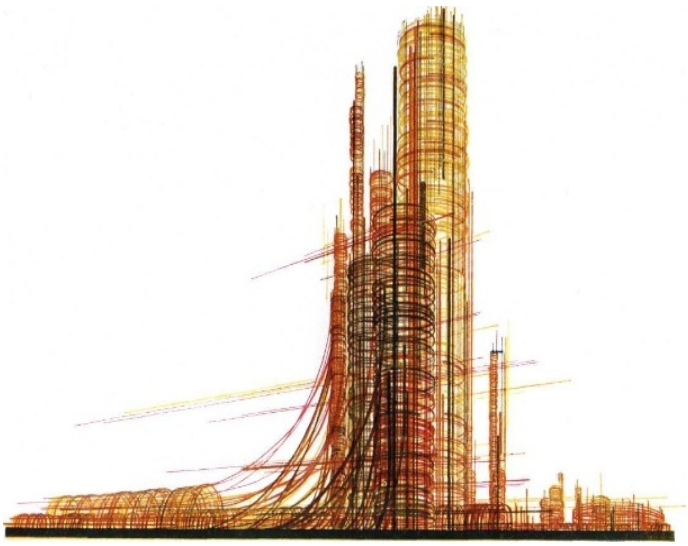

Fig.10
Yakov Chernikov Composition no. 18 Vertical and Horizontal Dynamics
(http://www.bdonline.co.uk/)

Fig. 11
Zaha Hadid, Galaxy Soho- Beijing, model,
(http://www.designboom.com/)

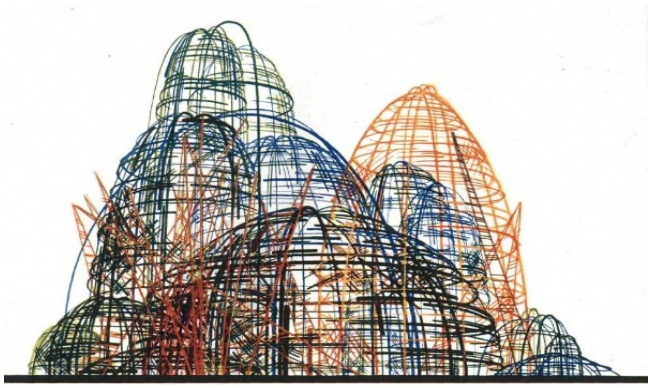

Fig. 12
Yakov Chernikov Composition no. 89, Combination of curved and straight lines with colour illumination, Architectural Fantasies, 1929-1933( http://www.bdonline.co.uk/)

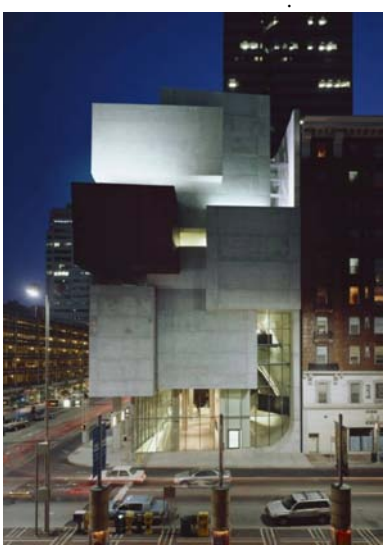

Fig. 13
Zaha Hadid, Contemporary Art Center, Cincinati 2003
(http://www.zaha-hadid.com)

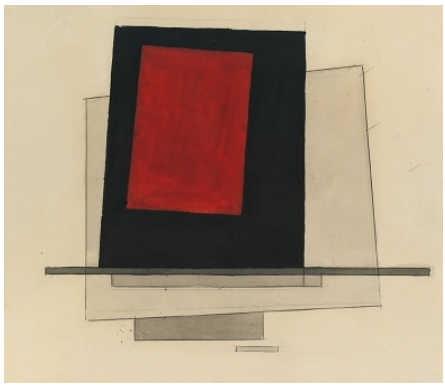

Fig.14
Ilya Chashnik., Suprematist Composition 1921/1922
(http://ottenkunstraum.at/en/)

## 2.4 Proun

Hadid's architecture is embedded into Suprematism more than one can notice through a similarity of image and composition comparison. Giovannini, for example, finds in Vitra Fire Station the first Suprematist building. ”With the Vitra Fire Station, Hadid already superseded her mentors Malevich and El Lissitzky”[15], he is telling us.

El Lissitski is the one who introduces in the Suprematist imaginary the overlap and the simultaneity of multiple points of view. And Hadid is employing at Vitra a “collage of viewpoints.”[16]

When mentioning Lissitzki he might well thought also about Lissitski's experiment: proun – acronym for ”project of the affirmation of the new” according to Dickerman.[17]. The proun introduces the third spatial dimension into the picture in two ways. One is by introducing perspective and axonometric views to the former rather planimetric composition that Suprematist were using. The other is by creating volumetric collages, a different approach that without transforming the painting into an independent sculpture as Malevich used in his architecton studies. Lissitzki experiments with this in a type of three-dimensional compositions similar with architectural models. (see fig.16)

This creative strategy is investigated by Hadid in her paper reliefs. These are a series of white paper reliefs. They are not sculptures, but rather bas-reliefs. (see fig.15). It is obvious that Hadid carefully analysis what Lissitzki is calling “ the station where one changes from painting to architecture.”[18]

This idea of the bas-relief is a starting point for her more recent architecture and I have proved that it comes as a progression from Suprematism, following Hadid's own interpretations and investigations.

Patrick Schumacher explains, with regards to BMW Central Building, the conceptual layers that overlapped in order to generate space and form. It is about superposing three different analysis : terrain, context – but not in a contextualist manner but rather regarding possible links between the neighborhood and also the functional need of the building that was supposed to find the right place for technological lines, design offices, special workshops, visitors spaces and path, informal spaces for employers.

The result [19] of this analysis is presented diagrammatically as a superposition of:

- preliminary vectorized diagram
- preliminary analysis diagram for the functionality of the building
- preliminary diagram for the terrain analysis.

By overlapping this diagrams Hadid is creating a preliminary model, bas-relief type, that is the starting point of the architectural object.

This analytical-creative procedure shows the approach, the way of understanding and dissecting existing data in order to create space and urbanity. In this process all the artistic investigating tools are employed from ink drawings, analytical or environmental hand sketches, large scale paintings, working models, bas-relief models and 3d computer modeling.

Fig.15
Zaha Hadid, cut out paper reliefs, Conceptual Group Exhibition,Zurich,2007 (http://www.arndtberlin.com)

Fig.16
El Lissitski, proun room, 1923
(http://www.domusweb.it)

## 3 SUPREMATISM AS A LIFE PROJECT

The dusty, rusty and heavy, laboratory door through which young Zaha entered in 1977 proved to be full of creative energy that she harness, analyzed and transforms through her entire career. There are 36 years between her diploma project and Galaxy Soho Beijing project, which shows that Suprematism is her life project. She is confessing that "... I always planned to change the system and ultimately do the the theoretical project, whatever it might be..." . [20] Whatever her theoretical project might be it has deep creative roots in Suprematism.

Her creative tools for discovery , pushing the limit of the imagination towards unexplored areas, came out of a need for representation beyond architecture's orthogonal formalism.

To this end she developed architectural representation as big oil canvas on a strong vein coming from Malevich. She transformed abstract Suprematist sculptures into architecture. She interpreted utopian 1920 drawings into actual real architectural objects. She continuously investigated the unequivocal relationship between bi and three-dimensional representations. The paper cuts sculptures inspired by the proun lead to a series of architecture based on " a topography that folds, slopes, and shears giving dimension to a plane normally conceived as flat." [21]

Starting from the Suprematist images dominated by the rectangle and the square angle as well as the skew family derived from them – the parallelogram- Hadid gradually adopts random curved elements that create images far away from the Suprematist imaginary.

I find in this evolution a similarity with the development and change happened to Hans Arp imaginary vision during his pre dadaist time. There is a shift in Arp's work from rectangular type of compositions and collage, to flat volumes - pour in concrete or cut out in wood - that follows arbitrary curvilinear contours. This stage of his work is synonymously with Hadid paper cuts work.

Hadid approach to put together architecture and art – 50 years old Avant-garde art – is unique. By doing so Hadid is recovering the emotional and oneiric touch that architecture lost during Modernism in exchange for utility, full readable use of the building, the so called honesty of the building. Hadid dared to challenge the architectural culture in a similar way in which Suprematism challenged the institutional art of the time. And by doing so she liberates architecture and the architectural image.

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[iii] Hadid graduated Mathematics at the American University in Beirut

# HEAT ISLANDS ON THE 45TH PARALLEL NORTH

**Mihnea Draganescu**[1]

[1]*Ion Mincu University of Architecture and Urbanism Bucharest, ROMANIA*
*m.mdraganescu@gmail.com*

## Abstract

In the context of ever higher urban development in the past 100 years, the vertical trend of city planning, the increase in anthropic areas and the continuous need of more and more urban space, man's activities are felt not only on a visual perceptible level, but also in a climatologically geographical context that the specific areas are part of. As any relation, of any sort, this is a multifocal one. Thus, man leaves his footprint on nature and nature, in return, reacts.

Apart from the obvious and relatively fast actions that vary from landslides to the lack of soil productivity, nature's reactions to human activities can be unperceived instantaneously. These reactions are felt in time and often cumber the human activity set up for a particular spot, on various levels. One of these reactions is the climatic change, more obvious in urban agglomerations, where human activities are concentrated and have their toll on the environment.

Undoubtedly, one of the effects of human activity – in any natural environment – is, as nature's response, the warming of the aria occupied and affected by humans. It has been proven repeatedly, by various studies, that an urban area is warmer, literally, than its adjacent untouched surroundings. The causes, already studied and known, vary from typical human activities to – paradoxically – the lack of a good enough landscape design within cities. Therefore, an urban area, in the worst case scenario, can be up to 30 degrees C higher than a virgin one in a similar area. The difference in temperature only translates into more power usage, resulting in ever more heat island effect.

We have to realize the fact that humankind – with the help of its technologies – is in the middle of inverting in just a few hundreds of years a process that has taken 500 millions of years to come to life. We are depleting our coal and oil resources approximately 2 million times faster than it took for them to be born and, as a consequence, not only are we exploiting nature at a pace never seen before, but we are also creating an experiment with unforeseen results.

Our duty as architects, master planners and landscape designers goes far beyond planning for less energy consumption on a medium term, it goes as far as responding to an environmental crisis that has already shown its beginning. In order to leave behind us a world in which the future generations would choose to live, the clear message that we have to send out is: LESS IS MORE!

Therefore, I considered of utmost importance the comparison of several cities situated on or close to the 45th parallel North in respect of their behavior as heat islands, in order to find their common denominators and to achieve a set of rules and guidelines in planning either singular buildings or entire cities that have little or no impact on the natural environment they are set in.

The cities chosen for the study are Chicago and New York, in the United States, Bordeaux in France, Bucharest in Romania, Urumqi in China and Sapporo in Japan. They are all placed on the 45th parallel North and, theoretically, should have the same climate characteristics.

The conclusions the study has revealed are somewhat surprising, as they reveal the fact that not only the human activities in cities (such as industry, car traffic, air conditioning and so on) are to blame for the higher temperatures, but also – and even more so – the lack of attention paid to the natural environment and the benefits it can bring when planning. This template will assist you in formatting your paper. Please, copy it on your computer and insert the text keeping the format and styles indicated. The various components of your paper (title, abstract, keywords, sections, text, etc.) are already defined on the style sheet, as illustrated by the portions given in this document. [Times New Roman, 12-point, justified alignment]

**Keywords**: heat island, landscape, environment, energy

## 1 INTRODUCTION. GENERAL CONTEXT

As a result of the ever more rapid urban development in the past hundred years, the vertical and agglomerated development of cities, the ever higher human use of natural areas, the growth of human settlements – from villages to megalopolis, be they cities with extensive metropolitan areas or long chains of continuous metropolitan areas – and the continuous need of anthropic spaces, human activities are felt not only on a visually perceptible level, but also in the geographical and climatologic context that these areas are part of. As any relationship, of any sort, this is a multifocal one. Thus, humans leave their footprint on nature, by modifying its primordial characteristics, changing it, and the natural environment reacts.

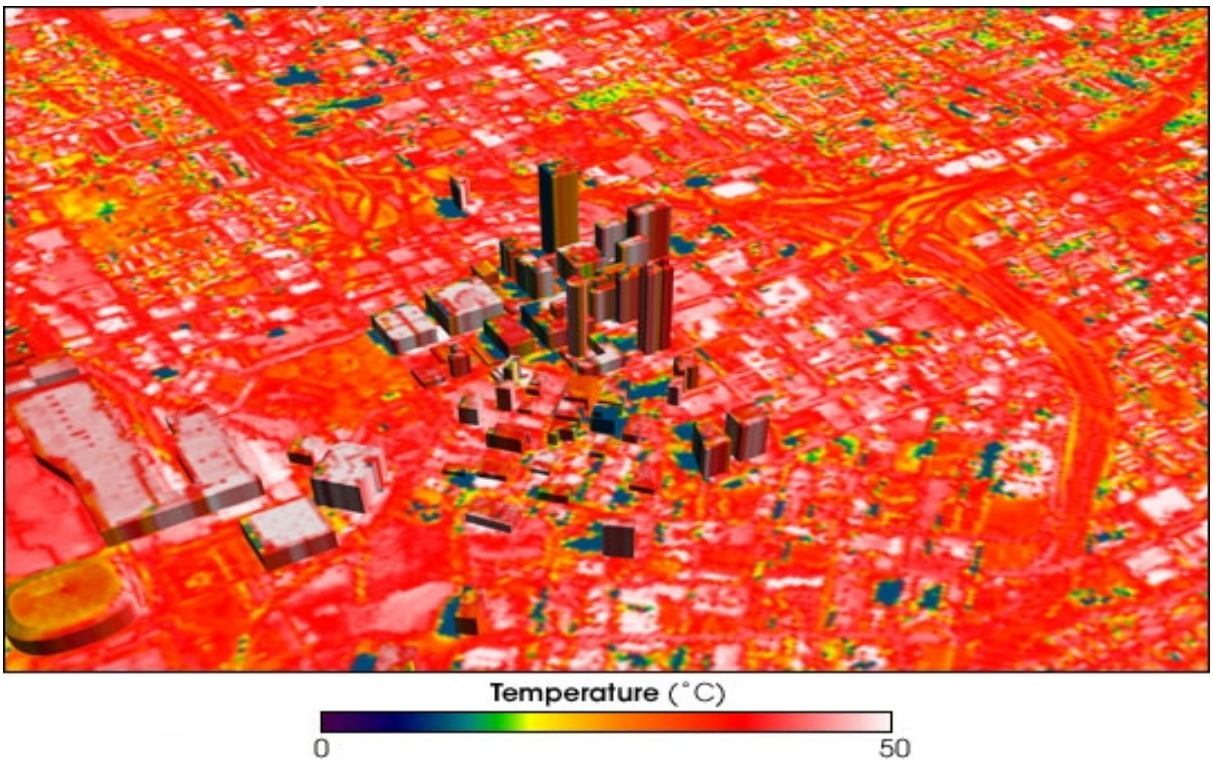
Urban development leads to changes in both the resident and adjacent landscape, thus generating new landscape typologies, with their own characteristics, mainly results of human activities. In time, the anthropic and the environment – be it the natural surroundings of the anthropic areas, the anthropic area itself or the specific cultural landscape – begin to coexist in a symbiotic relationship, conditioning one another. For this symbiosis to resist the test of time, a balance must be reached. This balance is, however, a very fragile one, one in which both parties are equivalent. It all comes down to mutual respect. Unsuccessful situations are spread throughout history. In Pompeii, for example, the urbanisation process occurred in an environment that proved to be hostile by definition, the city being – literally – turned into ashes almost instantaneously compared to the human history time span. Nature overwhelmed the urban development incredibly fast. Other examples that can be given are Detroit and Tokyo, where nature was subdued at first and it responded abruptly, refusing to further offer a setting that would be auspicious to human life.

Apart from the obvious and rather fast reactions that vary from landslides to the lack of soil productivity there are also reactions on nature's behalf that take longer periods of time to complete and be felt. They are perceived over time and often cumber – under various aspects – the human activity initially planned in the respective area. One of these reactions is the climate change that the present paper tries to analyse and to which it aims to find practical answers.

### 1.1 Heat Islands

Undoubtedly, one of the effects of urbanization – in any natural setting – is, as nature's response, the rise in temperature of the area occupied and affected by human activity. It has been proven, through various studies, that an urban area is literally hotter than its adjacent, untouched siblings. The causes are already known and vary from human activities that generate heat to the paradoxical lack of intelligent landscape planning.

**Heat islands** are urban areas that are significantly warmer than the surrounding rural or natural areas, mainly due to human activities that occur inside them. The phenomenon was first investigated by Luke Howard, in 1810, although the actual term was introduced much later.




(Fig.1 – infrared view of Atlanta in August; source: earthobservatory.nasa.gov)

The difference in temperature between heat islands and the surroundings varies from 3 to 5 C during daytime and can go as high as 10-12 C during the night. The main cause of these differences is the modification of the territory by urban developments that use materials with high heat retention qualities. The heat resulted from energy usage – in any form – is a secondary contributor.

Heat island characteristics can affect the population in various respects, from energy demand during the summer, to air pollution, greenhouse gas emissions, the appearance of heat related diseases and an increase in mortality, to the decrease of water quality, and so on. As the population grows, it obviously tends to construct more and more buildings, rise more skyscrapers and convert ever more natural spaces into urban ones, all these leading to a permanent increase in the average annual temperatures of the used areas.

The regions with high population or in which an increase in population growth is occurring coincide with these that have high heat island potential.

From the point of view of seasons, the heat island character is present in cities during both summer and winter. Research however shows that the heat island effect reaches its peak in August, due to the increased demand in energy needed for heat comfort (mainly air conditioning). The temperature differences between urban/ suburban and rural/ natural areas are much lower during winter.

The differences are usually much higher at night time than during the day and are perceived to their fullest mainly when there is little or no air movement. These variations are highly linked to wind speeds and sky cloudiness. Geographically, heat island effects are felt to their fullest in tropical and subtropical areas, where the differences in temperature between day and night are naturally the highest.

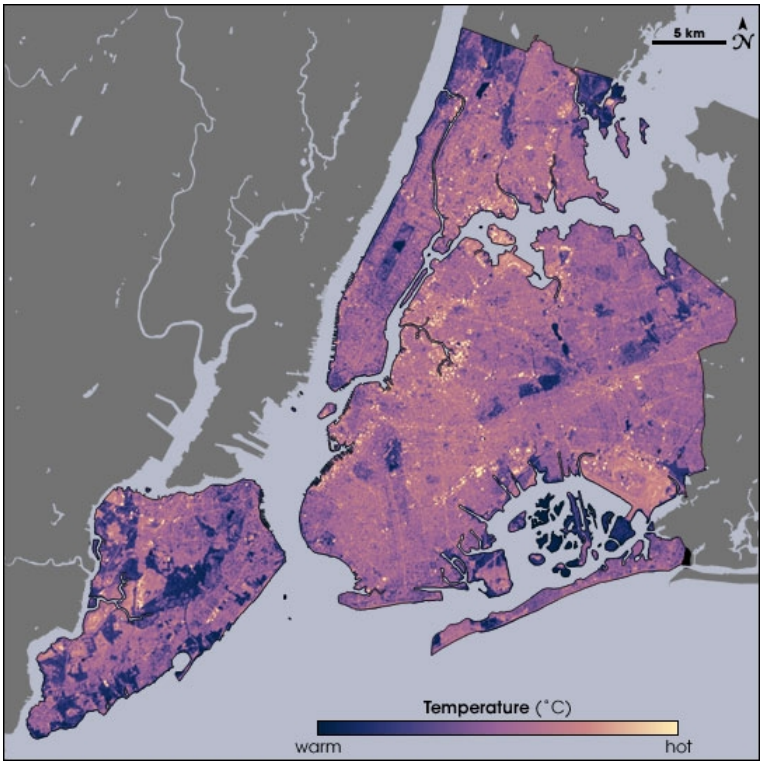
In order to understand the heat island character of urban agglomerations, some comparative answers are needed, that address the following question: *"how do heat islands process heat differently than suburban, rural and natural areas?"*.

- Heat islands can increase sky coverage and rainfall within the city.
- During the day, in rural areas, the sun energy absorbed by the ground evaporates the water in vegetation and soil; thus, even though we are talking about sun heat accumulation, it is to a very high extent compensated by the cooling through evaporation process; in cities, where there is less vegetation, the buildings, streets and sidewalks absorb and retain most of the heat.

- As in cities there is less water (rainfall, fog, dew, etc.), the heat is stored because the pavements are not porous or poriferous; therefore, the cooling process through evaporation of the water in the soil does not occur.
- The heat discharged by buildings, cars and public transportation also contributes to the heat island effect in cities; the heat they generate makes its way to the atmosphere and is stuck there, having a ratio of 1/3 of the heat of the sun (we are thus discussing a 33 percent increase in heat).
- The thermal properties of buildings transfer the heat of the air in the atmosphere through conduction. Tar, bitumen, asphalt, brick and concrete are much better heat conductors than vegetation and water.
- The canyon like structure of high rise buildings often contributes to the increase in heat as well. During the day, the solar energy is blocked through the multiple reflections off the facades of the buildings, whilst heat losses through infrared are diminished by absorption.

The heat island effect can increase the magnitude and duration of heat waves inside of cities, maintaining and prolonging their existence. The heat island effect can be extremely vicious during a heat wave, as the city cannot offer the needed thermal relief, not even at night. In the United States, for example, more than 1000 people die each year because of extreme heat.

One can clearly notice the strong link between the density and percentage of vegetation and water and the heat stored by an area. For instance, the following images present the temperature of New York City (fig. 2) and, respectively, its planted and water areas (fig.3).




(fig. 2 – New York City temperatures; source: earthobservatory.nasa.gov)


(fig. 3 – New York City vegetation and water; source: earthobservatory.nasa.gov)

We have to realize the fact that humankind – with the help of its technologies – is in the middle of inverting in just a few hundreds of years a process that has taken 500 millions of years to come to life. We are depleting our coal and oil resources approximately 2 million times faster than it took for them to be born and, as a consequence, not only are we exploiting nature at a pace never seen before, but we are also creating an experiment with unforeseen results.

Our duty as architects, master planners and landscape designers goes far beyond planning for less energy consumption on a medium term, it goes as far as responding to an environmental crisis that has already shown its beginning. In order to leave behind us a world in which the future generations would choose to live, the clear message that we have to send out is: ***LESS IS MORE!***

## 2 CASE STUDIES

In order to underline the presence of the heat island effect in urban agglomerations and to emphasize the factors that lead to or counteract its characteristics, several cities situated on (or very close to) the 45th parallel North have been chosen as case studies. In theory at least, they should have the same climate (as they all belong to the same climate regime – the temperate continental climate zone).

The main climate characteristics of the temperate-continental climate area are:

- Warm summers (the average monthly temperatura is between 20 and 30 C)
- Harsh winters (the average monthly temperatura is between -10 and -40 C)
- Highest yearly termal amplitudes
- Yearly rainfall between 250 and 500 mm
- The presence of the Northern winds

The cities chosen for the study are, from West to East: Chicago and New York in the United States, Bordeaux in France, Bucharest in Romania, Urumqi in China and Sapporo in Japan. The case studies will materialize in a comparative matrix that takes into account the following sections relevant for the heat island character of the cities:

- Morphology
- Topography
- Water percentage
- Building positioning in relation to the dominant winds and cardinal points
- Other factors of influence (if any)
- Population
- Main dwelling typology
- Surface of the city
- Population density
- Specific activities and cultural landscape
- Specific vegetation and percentage of planted areas
- Age of the city – genius locci – streets, rooftops, facades
- Average temperatura during summer/ winter
- Relation with the local context and the territorial surroundings

| | Chicago | New York | Bordeaux | Bucharest | Urumqi | Sapporo |
|---|---|---|---|---|---|---|
| Criteria | | | | | | |
| Morphology | Even orthogonal grid | Even orthogonal grid | Organic development | Circular/ radial development | Even orthogonal plan | Organic development |
| Topography | Flat terrain.<br>On the shore of lake Michigan | Flat terrain.<br>On the Atlantic coast. On the banks of the Hudson River | Hills.<br>Close to the Atlantic coast | Flat terrain.<br>On the banks of the Dambovita and Colentina Rivers. | Flat terrain. | Hills.<br>Between the Sea of Japan and the Pacific Ocean. |
| Water percentage | 3% | 35% | 1% | 2% | <1% | 4% |
| Building positioning | On streets parallel and perpendicu-lar on one another | On streets parallel and perpendicu-lar on one another | Organic | Organic | On streets parallel and perpendicu-lar on one another | Organic |
| Other natural influence factors | Influence of the Great Lakes (decrease of temperature up to 5 C) | Influence of ocean winds (decrease of temperature up to 3 C) | Western winds (decrease of temperature fluctuations) | - | The city furthest from any sea/ ocean – increase of temperature | Influence of ocean winds |
| Population | 2.75 mil | 8.45 mil | 1.15 mil. | 2.3 mil. | 3.1 mil. | 1.95 mil. |
| Main dwelling | Collective housing units | Highrise collective | Houses | Highrise collective | Highrise collective | Highrise collective |

| | | | | | | |
|---|---|---|---|---|---|---|
| typology | (3 levels) | housing units | | housing units | housing units + houses | housing units |
| City area | 606 km² | 1214 km² | 50 km² | 228 km² | 10245 km² | 1121 km² |
| Population density | 4474/ km² | 10725/ km² | 4900/ km² | 8260/ km² | 210/ km² | 1710/ km² |
| Specific activities | Industry. Services. | Industry. Services. Tourism. | Winery. Tourism. | Industry. Services. | Industry. | Services. |
| Specific vegetation | Deciduous | Deciduous | Deciduous | Deciduous | Deciduous | Coniferous |
| Planted areas percentage | 18% | 21% | 30% | 14% | 8% | 17% |
| Age of the city | <300 years | <300 years | 2000 years | 550 years | <100 years | <200 years |
| Temperature (winter) | -4 C | 0.3 C | 4 C | -2.5 C | -11 C | -3.6 C |
| Temperature (summer) | 24.3 C | 24.7 C | 21 C | 28.8 C | 30.2 C | 24 C |
| Relation with the surroundings | Suburbs | Metropolitan area | Rural area | Suburbs | Desert | Metropolitan area |

## 3 CONCLUSIONS

It can be clearly seen that, although they belong to the same climate area, the cities taken into account act very differently from one another in terms of temperature characteristics. Obviously, the differences are strongly linked to:

- Positioning in relation to the major natural topography elements.
- Specific human activity (translated into the degree and type of pollution it generates).
- The percentage of water and planted areas within the city boundaries.

Thus, the city Urumqi in China – China's 3rd most important industry host, which benefits from a very low percentage of water and green spaces – has the highest heat island effect, whereas Bordeaux, with non polluting activities, high percentage of planted areas and under the influence of the Western winds, offers the best set for urban comfortable living.

This paper represents the starting point for a much more complex research, still a work in progress, one that aims to find solutions to the problem of urban heating and the heat island effect cities are subject to. Of course, steps have already started to be made worldwide in this direction. However, in order to truly achieve the goal of counteracting the heat island effects in cities, architects should pay much more attention nowadays to the materials used on facades and roofs, to the orientation of the building on the plot according to basic cardinal point rules, landscape architects ought to rethink the paving materials (eg. porous instead of dense and compact), the trees and shrubs and the outdoor lighting solutions and water consumption (eg. stored rainfall water as opposed to pipe water for irrigation), and urbanists should take into account shading and wind movement when planning new boulevards, streets or building alignments in particular areas. These three planning entities should be working close together and take into account one another's professional needs, thus achieving better solutions for sustainable and heat island effect free urban communities.

Moreover, the study and its results may be adequate and applicable to cities that are nowadays built from scratch, as is the case of the ever developing urban agglomerations in the U.A.E. or China for example. It would serve as a set of baseline rules and regulations that will help avoid the excessive heat problems older cities are confronted with.

We should be planning together with the natural environment, not against it; we should see the advantages nature can bring in our field of work and not try to counteract it, as we would never fully succeed, as shown in the beginning of this paper. Nature knows best because, as the Pritzker winning architect Glenn Murcutt put it, ***"you'll never see an ugly tree"*** (Murcutt, Glenn, ROCAD International Conference, Bucharest, 2014).

# LIGHTNESS IN ARCHITECTURE: NEW STRUCTURES MADE OF NATURAL FIBER REINFORCED BIO-PLASTICS

**Engineer Ph.D. Giulia Santarelli**[1]

[1]*Sapienza Univerity of Rome, Faculty of Civil and Industrial Engineering, (ITALY)*
*giulia.santarelli@uniroma1.it*

## Abstract

Nowadays we can observe a paradigm change: the research for lightness through structural innovation replaces the concrete, massive and heavy traditional architecture.
Experimentation is the development's lifeblood, the starting point of the design process to go beyond the traditional construction made of reinforced concrete or steel and to investigate new structural materials, ever lighter and performing, but also economic and sustainable, as bioplastics. This is the focus of the reflection proposed, within a wider discussion pertaining to the theme of innovation in construction and sustainable design.
The plastic – the most used and wasted material of the contemporary time – is used for everyday objects, sculptures and works of art, but can become also a building material. Thanks to its lightness, durability, insulation property, and great range of applicability, this material is now widely used in architecture.
The first experiments in architecture date back to the Sixties, when the plastic became the protagonist of the design, assuming an aesthetic and formal dignity.
In order to increase the mechanical strength, the technological and scientific research has developed special composite polymer thanks to the associating of the polymer matrix with a fiber glass or carbon component. This process ensures high mechanical resistance value, comparable to the one of steel.
The material's structural efficiency if appropriately shaped and its malleability let the designers imagine curvilinear panels to realize futuristic transportable house: the symbol of a new way of living.
In this way, it is therefore to outline a new formal language suitable for those properties, that makes the fiber-reinforced plastic an excellent building material.
On the other hand, the carbon fibers costs are still too high and limit their use in the practice of construction.
The free forms of a creative bus station built in 2003 at Hoofdoorp in Holland with polystyrene structure, the prototype of an innovative building - Carbon Tower – made of CRP (carbon fiber reinforced polymer) and standardized and repeatable structures made up of modular GRP (glass fiber reinforced polymer) panels, are just some of the many expressive possibilities of plastics. In fact this material is malleable and configurable according to the different needs, following an always new creative process.
The excellent insulating properties, along with the moisture resistance, make this material appropriate for facades and window frames, ensuring observance of energy standards. Moreover the versatility makes fiber-reinforced plastic suitable for creating opaque or transparent structural and insulating panels.
Still too expensive for a cheap building, currently the most numerous and daring experiments regarding the use of GRP with structural function include, indeed, the construction of industrial buildings and pedestrian or carriageable bridges. In fact, in this case, the advantages accruing from it, offset the initial costs.

Nowadays, more and more attention to the environment and the product's sustainability has encouraged the scientific and technological research, supported by manufacturers, toward the use of renewable and recyclable materials in the composites production.
This biodegradable plastic derived from biological substances, rather than from petroleum, is characterized by mechanical, breaking and abrasion strength comparable to those of conventional synthetic materials.
Furthermore it is possible to use vegetal fibers in replacement of those of glass or carbon. This allows to obtain composite materials with high performance and low cost, therefore suitable for mass production.
The research concerning ecological materials has numerous and innovative outcomes; for example bio-plastics produced from corn flour or linen and cotton or biological waste and reinforced with carrot fiber.
From automotive manufacturing to industrial design, the bio-composites' diffusion is becoming increasingly important.
The malleability, lightness and strength, for example, have guided the choice of Danish architects 3XN to use this ecological materials for the construction of a pavilion for the exhibition "Future" at the Museum of Modern Art of Louisiana. A thin green ribbon made of bio-composites, wrapping around itself, becomes structure, sculptural art work and seating at the same time.
Although the main uses concern the automobile's production, the electronic and the everyday objects, the application in buildings field - considering the high mechanical strength – is becoming a possible perspective.
The low density of the natural fibers and the high load-bearing capacity allow to obtain construction elements considerably lighter when compared with the glass fiber reinforced ones. This weight reduction also implies a decrease in consumption.
The use of vegetable raw material allows both to obtain recyclable products compared to those of petrochemical origin and to access a wider segment of the market thanks to the low cost.
Today, the use of bio-composites reinforced with vegetable fibers opens new perspectives not only from a technical and constructive point of view but also aesthetical and formal one, for the transformation of the built environment and for the development towards a lightweight, sustainable, recyclable and low cost architecture.

**Keywords**: Innovation, lightness, bio-plastics, natural fiber, recycling

**Main Text**

Nowadays we can observe a paradigm change: the research for lightness through structural innovation replaces the concrete, massive and heavy traditional architecture.
Experimentation is the development's lifeblood, the starting point of the design process to go beyond the traditional construction made of reinforced concrete or steel and to investigate new structural materials, ever lighter and performing, but also economic and sustainable, as bioplastics.
The plastic – the most used and wasted material of the contemporary time – is used for everyday objects, sculptures and works of art, but can become also a building material. Thanks to its lightness, durability, insulation property, and great range of applicability, this material is now widely used in architecture.
The first experiments in architecture date back to the Sixties, when the plastic became the protagonist of the design, assuming an aesthetic and formal dignity.
In order to increase the mechanical strength, the technological and scientific research has developed special composite polymer thanks to the associating of the polymer matrix with a fiber glass or carbon component. This process ensures high mechanical resistance value, comparable to the one of steel.
The material's structural efficiency if appropriately shaped and its malleability let the designers imagine curvilinear panels to realize futuristic transportable houses: the symbol of a new way of living. These houses derived from the intent to transfer and implement in architectural terms the results of the irrepressible and overwhelming new synthetic materials development: from the experiments about geodesic domes in fiber glass reinforced plastics designed by the structures' master Buckminster Fuller (1954), to the fabulous and visionary *Monsanato House,* exposed in Disneyland Park, California (1957), from the *Bulle Six Coque* designed by Jean Manevel, to the dwelling made of polyester by the architects Pascal Hausermann, Bruno Camoletti end Eric Hoechel, to the very famous *Futuro House* by the Finnish architect Matti Suuronen, are all characterized by a structural envelope made of synthetic material. The concept of a flexible and expandable construction system becomes the organizing principle of Kunstoffhaus fg2000. This system is suitable to configure, although in seriality and standardization, at the same time simple and complex spatiality, adaptable and modifiable, where the combination and repetition of the same modular element ensure a potentially unlimited development. This experimental house was built in 1969 in Germany (Altenstadt), by German designer Wolfgang Feierbach - owner of the homonymous fiberglass furniture manufacturer - with the intent to test the potential of this innovative material. Indeed he tested the plastic structure to delineate large and flexible spaces, free of structural intermediate supports. The house is defined by the combination of thirteen structural "rings" [1].
The rapidity of construction, ease of installation and ease of transportation of prefabricated parts, characterize these early prototypes. In this way, it is therefore to outline a new formal language suitable for those properties, that makes the fiber-reinforced plastic an excellent building material. On the other hand, the carbon fibers costs are still too high and limit their use in the practice of construction.
The free forms of a creative bus station built in 2003 at Hoofdoorp in Holland with polystyrene structure, the prototype of an innovative building - Carbon Tower – made of CRP (carbon fiber reinforced polymer) and standardized and repeatable structures made up of modular GRP (glass fiber reinforced polymer) panels, are just some of the many expressive

possibilities of plastics. In fact this material is malleable and configurable according to the different needs, following an always new creative process.
The excellent insulating properties, along with the moisture resistance, make this material appropriate for facades and window frames, ensuring observance of energy standards. Moreover the versatility makes fiber-reinforced plastic suitable for creating opaque or transparent structural and insulating panels.
Among the experimentations aimed at identifying the best shape and technology to exploit the potential of fiber-reinforced plastic material composites, significant appears the construction system called ACCS (Advanced Composite Construction System) characterized by the use of modular panels: "*this innovative modular system has special appeal as emergency housing (especially in natural disaster or military situations), but can also be used to build a wide range of durable, easy-to-assemble structures capable of sheltering from two to five-hundred people*"[2]. This simple and economic system was developed by the British engineer Maunsell in the Eighties, with the aim of a large-scale industrialized production. The system consists of four elements that can be combined to obtain an unlimited number of possible configurations. The basic module consist of a pultruded fiber reinforced polyester panel, composed by seven tube profiles pushed together with square section, and featured by longitudinal grooves, necessary to insert the connecting element (second component of the system); the third is a three-way connector designed to join two adjacent panels and an orthogonal one; the last component is composed of both a grooves and two connecting elements. The panels are suitable for realizing each part of the construction, from the vertical structures to the floor and the roof. The combination of individual elements on site ensures easy portability. The box structure that results from the combination of standard panels, is, thanks to its lightness and deformability, designed to withstand seismic actions.
The innovative character of this experimental constructive method lies in the joint system extremely simple but durable, able to allow rapid assembly without the intervention of specialized labor and to ensure, if necessary, the possibility of a subsequent removal, for example to build small temporary accomodations.
Still used today, this efficient system - called "COMPOSOLITE: fiberglass building panel system" by the manufacturer (Strongwell) - is mainly used in the construction of buildings, bridge decks, plattforms and walk ways, bridge enclosure system [3-4].

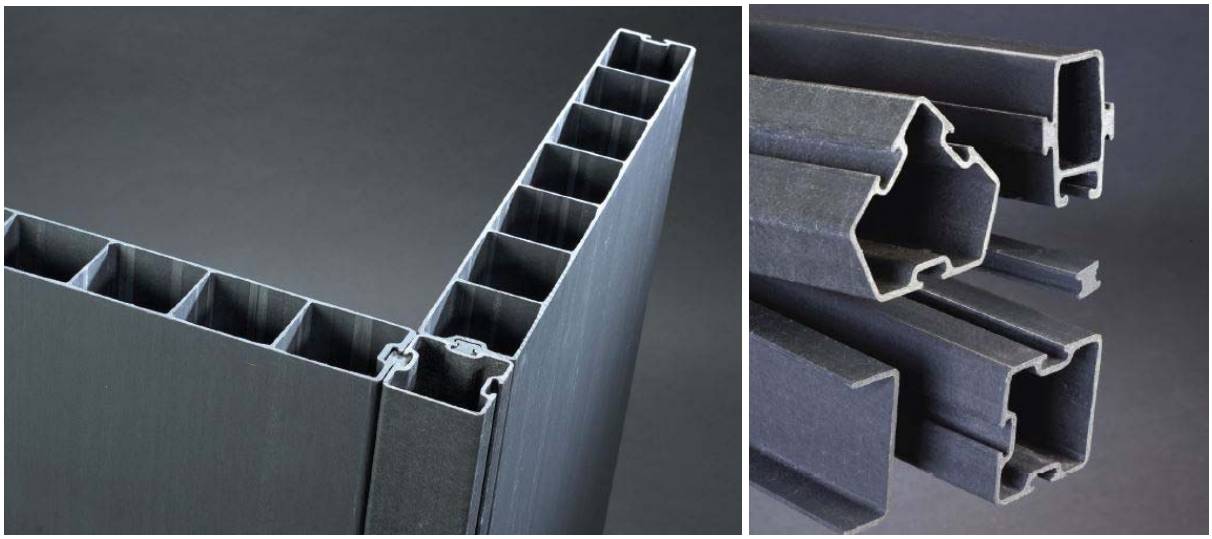


Fig. 1_Composolite: Fiberglass building panel system, Strongwell. Images courtesy Strongwell Corporations.

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Furthermore it is possible to use vegetal fibers in replacement of those of glass or carbon. This allows to obtain composite materials with high performance and low cost, therefore suitable for mass production.
"*The biocomposites combine extremely light and stable plant fiber with a matrix of conventional or biodegradable polymer: […]* [the fibers can be derived from] *plants such as cotton, flax, hemp and jute, the surrounding matrix can either be made from conventional synthetic thermosetting and thermoplastic materials, or produced on a natural basis with vegetable starch, lignin or vegetable oils"* [5].
For example the BioPDO - derivative of corn flour - is used by DuPont, leader in this field, for the production of two thermoplastic polymers with high technical performance, *Hytrel* and *Sorona*, specially designed for engineering purpose [6].
As part of the plant fibers is particularly interesting the *Curran* [7]: this bio-fiber is obtained from festering carrots and his characteristics are very similar to those of carbon. The considerable tensile strength, in fact, is exploited by Cellu Comp to produce composites with high performance. Another interesting bio-material is the *Fasalex*: "*this is a wood product made of biological renewable raw materials manufactured by using the plastic technology process extrusion. This material always consists of natural fibres like wooden chips, rice husk, sugar cane, bamboo or straw more than 70%, of plastics, natural resins and additives and of course there is always a thermoplastic biopolymer like maize, rice or corn in the materials. […] Fasalex is a wood material with the characteristic of wood. The profiles can be veneered and foliated with convential hot melt lamination systems, also painting with water based lacquers and even powder-coating is possible.*" [8]. The cheapness of the composite allows the profiles production at low cost.
It is possible to obtain fibers to be used for bio-composites not only from plants, but also from igneous rocks. The basalt fiber *"lies between glass and carbon fiber in terms of quality, and is resistant to heat and chemicals. It is also significantly cheaper than carbon, making it suitable for the mass market*" [9].
The research concerning ecological materials has numerous and innovative outcomes; for example bio-plastics produced from corn flour or linen and cotton or biological waste and reinforced with carrot fiber. Among the possible uses, there are for example "*the bodywork components of the BioConcept-Car* - explains Christiane Sauer - *made from a flax-cotton textile previously impregnated with linseed oil acrylate. The flax fiber provides the stability, while the cotton is elastic and better at absorbing impacts*" [10].
From automotive manufacturing to industrial design, the bio-composites' diffusion is becoming increasingly important.
The malleability, lightness and strength, have guided the choice of Danish architects 3XN to use this ecological materials for the construction of a pavilion for the exhibition "Future" at the Museum of Modern Art of Louisiana. "*Flax fiber mixed with corn starch and soya oil*" [11] constitutes the raw material of the thin green ribbon that, wrapping around itself, becomes structure, sculptural art work and seating at the same time.

Although the main uses concern the automobile's production, the electronic and the everyday objects, the application in buildings field - considering the high mechanical strength – is becoming a possible perspective.

Fig. 2_3XN architects, Louisiana Pavilion, Future exhibition, Louisiana Museum of Modern Art, Danimark, 2009. Image courtesy 3XN architects.

Currently, high strength fabrics made of flax and hemp fiber are produced for structural strengthening of existing masonry buildings, for example the Fidflax (flax) and Fidhemp (hemp) marketed by the Italian company Fidia [12].

Fig. 3_FIDFLAX GRID 300 HS20®: balanced grid flax fiber sheet for structural strengthening; FIDFLAX UNIDIR 430 HS43®: unidirectional high strength flax fiber sheet for structural strengthening; FIDHEMP UNIDIR 240 HS22®: unidirectional high strength hemp fiber sheet for structural application; FIDBASALT UNIDIR 400 C95®: unidirectional basalt fiber sheet for structural strengthening.
Image courtesy FidiaTechnical Global Services.

The use of recyclable bioplastic for the building facades has been tested at the Institute for Building Construction and Structural Design (ITKE) at the Faculty of Architecture and Urban Planning, University of Stuttgart, Germany (Prof. Dr.-Ing. Jan Knippers), during the "Research Proiect Bioplastic Facade". They built a pavilion characterized by the composition of tetrahedral elements realized through the development of an innovative recyclable bioplastic: "*extruded sheets made of the bioplastic materials developed by Tecnaro throughout the project are thermoformed into identical pyramidal moulding components*". The material used, called Arboblend, was developed by Tecnaro: this material is "*thermoformable and made primarily (>90%) from renewable resources. […] This special type of bioplastic granules, can be extruded into sheets which are further processable as needed: they can be drilled, printed, laminated, laser cut, CNC-milled, or thermoformed to achieve different surface qualities and structures and various moulded components can be produced. […] Thermoformable sheets of bioplastics* – explain Knippers - *will constitute a resource-efficient alternative in the future as they combine the high malleability and recyclability of plastics with the environmental benefits of materials consisting primarily of renewable resources*" [13].
The low density of the natural fibers and the high load-bearing capacity allow to obtain construction elements considerably lighter when compared with the glass fiber reinforced ones. This weight reduction, if compared to conventional polymers, also implies a decrease in consumption.
The use of vegetable raw material allows both to obtain recyclable products compared to those of petrochemical origin and to access a wider segment of the market thanks to the low cost.
The lightness and economy, as well as resistance and insulating ability and resistance to fire, highlighting the applicative potentialities of natural fiber reinforced bioplastics in the architectural and structural field; and particularly in the construction of low-cost housing, temporary, lightweight, removable, transportable, to be used, for example, in conditions of emergency housing, caused by natural or antropic disasters. A possible development line in this field consists, for example, in combining construction systems concretely adopted as "composolite", discussed above, with the use of natural fibers reinforced bioplastics, to effectively respond to the needs of removable, easy to assemble, transportable, environmentally friendly, recyclable and low-cost housing, required by emergency situations.
Today, the use of bio-composites reinforced with vegetable fibers opens, therefore, new perspectives not only from a technical and constructive point of view but also aesthetical and formal one, for the transformation of the built environment and for the development towards a lightweight, sustainable, recyclable and low cost architecture.

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# HYPERMODERN CONTINUITY

**Simona Butnariu**

[1] *Teaching Assistant, PhD Architect, "Ion Mincu" University of Architecture and Urban Planning, Bucharest, Romania*
*simona.butnariu@uauim.ro, butnariu_simona2000@yahoo.com*

## Abstract

Experiment replaces tradition and popular culture develops a thirst for novelty. Progress is continually sought, yet constantly questioned and undermined. More paradoxically still, the seemingly unstoppable forward trajectory of the evolution of information and communication techonology results in nostalgia – if not an overt longing for the past, then a formless regret and a melancholy feeling that something of the world has been lost. And this, in turn, feeds in to changing aesthetics and conceptions of beauty. Today architects designs integrated building bodies, trying to change our view on what is beautiful. This new concept of continuity the raw material and the its sculpting in one piece merge into an ideology of smoothness, fluency, flexibility and energy resulting from the friction of flows, people and information gathered in a common area. This paper focuses on how these principles are translated and hybridized in the practice of the architecture and urban design offices all around the world.

**Keywords**: urban design, urban ambiance, seamless, continuity, hypermodern, connectivity.

## 1 INTRODUCTION

This research aims to sketch a radiography of the latest trends in architecture and urban design that negotiates new limits between public and private sphere, between coexistence and transversal dimension, between horizontal and vertical, between permeable and transparent, between convivial and spectacular. These situations are deliberately sought in the metaphorical sense of the street. According to Rob Adams [1], it is the street that makes the city and according to Xavier Fels in fact, *street design and management is one of the major challenges in the planning of the 21st-century city*[2]. Mobility has started to become a central component in contemporary urban life, in the functioning of the city and in the dynamics of a society in the informational age.

The physical urban environment, despite the impoverishment to which it is currently subject, is in fact a vital part of our human experience. As Xavier Fels points out, the seduction of place still exists, and the spread of cyberspace will not be able to substitute for the functions of the tangible public realm, for *the extra dimension provided by face-to-face contact, live experience, unexpected emotion, the pleasure of smells, tastes and sensations that cannot be conveyed by telecommunications* [3].On the contrary, it is precisely the expansion of the virtual, globally connected world that renders specific places increasingly appealing and thus important. The new technologies make everything non-virtual more valuable. Francois Archer considers that the densification process is a paradox effect of information and communication technologies. It is true that the possibility of the remote communication removes the need for certain journeys, but it generates many others.

The fact that accessibility is no longer the discriminating factor makes the other qualities of a place fundamental to its ability to attract**.** Thus atmosphere, character, and sensorial qualities are becoming key factors in the definition of a place, even from an economic perspective. For example, it is fascinating to see how the urban walks and urban tourism have become popular all over the world, or how certain streets are transforming into open areas filled with café terraces, which had previously been alien to their culture.

The main objective of this paper is that of synthesize and inventorize the contemporary typologies of ambiances that currently inspire the practice in urban design. The second objective is to draw attention to a more complex society where lifestyles and social practices are increasingly differentiated and shifting and therefore we need diversity and versatility of streets. This are the aspects that users tend to forget and that 21th-century urban planners and traffic engineers often neglected, too often applying models of functional specialization whose limitations are more and more apparent today. Connectivity instead of functional separation forms the clue to much needed flexible and scalable energy-efficient strategies.

## 2 CONTEXT

Studies and descriptions of the last decades have attempted to represent the new qualities and increased complexity of urban phenomena. To suggest these new conditions, authors have resorted to adjectives or nouns modifying the word "city." It is clear from the diverse viewpoints these represent that a unified vision of the urban has been renounced in the face of the complexity of the phenomena being observed and analyzed. Is it possible to combine the different approaches from the Compact City, Sustainable City, Creative City to Authentic City as a product of Integral Urbanism with a "sensorial urbanism, "capable of offering a broader understanding of urban settings, interested in describing the character and atmosphere of places, and aiming to contribute to a new definition of public space? As so poetical Mirko Zardini concludes, it is obviously that: *despite their diversity of approach, all of these studies reveal how the cities in which we live have changed, how our ways of looking at the city have changed, and above all, how we ourselves have changed*[4].

### 2.1 Integral urbanism

As we previously argued, design's contribution to liveability, then, is not simply about form and morphology. It is about content, context and the capacity to foster conviviality, rhythm and movement. Liveable places should have plenty of opportunities for informal, casual meetings; street markets; a variety of comfortable places to sit, wait and people-watch; friendly 'third' places (cafés, pubs, bars, coffee houses and so on) [5]; and, above all, a sense of identity, belonging, authenticity and vitality. Architectural theorist Nan Ellin has expressed this in terms of what she calls '*Integral Urbanism'*[6]. The key attributes of integral urbanism, she suggests, are hybridity, connectivity, porosity, authenticity and vulnerability. Hybridity and connectivity depend on juxtaposition, simultaneity and the combination and linking of urban functions, connecting people and activities at key points of intensity and along thresholds between districts. Porosity depends on the visual and physical integration of the historic and the contemporary, of nature and the built environment, and of the social, cultural and physical dimensions of a town. Authenticity depends on both large-scale and small-scale interventions that are responsive to community needs and tastes and that are rooted in local climate, topography, history and culture. Vulnerability depends on a willingness on the part of urban planners and designers to relinquish control, to let things happen, and to allow for serendipity. These qualities place a premium on process rather than outcome, and on the symbiotic relationships between people and places. The goal of integral urbanism is to ensure places that are 'in flow', where a city's physical settings and people's experiences of them are inseparable and reliant upon one another. Ellin observes: *Encountering a place that is not in flow, the French typically remark that it lacks soul (Il n'a pas d'âme). Americans tend to say that it lacks character. Places that are in flow are characterized by the French as animé (animated, spirited, or soulful) and by Americans as lively* [7].

### 2.2 The reaction against functional specialization

In essence, from Francois Archer point of view, the city offers two primary resources: the quantitative resource, the one of a large numbers, which gives power and allows the economy of scale and the qualitative resource, which in the particular way opens way *to serendipity – the finding of the unlooked for* [8]. Functional specialization, whether in industry or urban planning, mainly exploits the resource of numbers. Today, however, in an ever more complex society where the creativity and innovation plays an expanding role, the new models of performance exploits the inherent potential of unexpected meetings, unscheduled exchanges, chance transfer of ideas and technologies. In this context appears the need of the multifunctional and multimodal streets as medium of frictions, incidentals and haphazard confrontations with the other. This doesn't imply that the need for functional specialization has completely disappeared. The motorway and the pedestrian-only street are the extreme examples on the scale of functional specialization and its right for them to still exist. The actual trend is to restrict them to specific situations and increasingly combine to other forms of streets, even conditioning the parallel existence of multifunctional and multimodal streets. Moving big urban expressway infrastructure underground allows the city floor to be freed and the functions of the street as place of activities can be reconciled. Thus, the information and communication technologies are not an alternative to increased speed and density. On the contrary, as Francois Archer argues it stimulates higher mobility and urban polarization. As a result, a space crisis is born in the city center and promotes mediation between public and private boundaries of public spaces limiting the horizontal direction as expansion and offset this by the vertical rise.

### 2.3 Link in the city

As a reaction against fragmented and collaged image of the postmodern city during the 1980s, the architects of the early 90s sought to re-establish continuities between the separated pieces of city's fabric. They decided that the situation is no longer tenable and that they should remedy it through new architectural and urban design forms that will give the flows of people, energy and commodities a surface of uninterrupted movement. In a sensitive way putted they felt more important to design a link in the city that connects different fragments of the

city then designing the fragments themselves. With this approach the city floor became the sixth façade that contains all the components of the street unified in an whole seamless surface.

A new paradigm wins the fields of architecture and urban design, the paradigm of a solid space that can no longer sustain the flows but it incorporates them in its actual substance. The English critic Jeffrey Kipniss (1993) describes this new paradigm: *a change from continuous heterogeneity in heterogeneous continuity* [9].

Figure 1: Gijon, Spain, 2005, architects: UNStudio, Ben van Berkel, Caroline Bos, The roof of the hall becomes a part of the landscape, providing local connections across the global connection axis and repairing the fracture to the city fabric created by the existing railway lines. Source: www.unstudio.com

Contemporary urban and architectural project examples show the variety and diversity of approaches already found a common principle: that of hypermodern continuity. In this continuity hypermodern challenge: many corners became round, vertical buildings carcasses became slopes, floors and slabs were held in ramps negotiated between public and private, between longitudinal and three-dimensional.

The study cases presented builds this current urban design concept similar concept as existing in industrial design technology which is called: seamless, ie one-piece, and seamless. The worldwide success of industrial design Apple Macintosh was to this area that deletes all thresholds or discontinuities, the object being filmy plastic single hide all the complexity and multiplicity of its components. Technical performance thus opened container assembly in an unlimited sway these smooth surfaces without boundaries and edges.

This concept of continuity has been taken over and in architecture and urban design. In many of the projects analyzed, concept design focused on incorporating all the technical and structural elements in one area and multiplied the idea of eradicating all differences inherent in conventional systems. This ideal of the hypermodern continuity was found in the transverse dimension of the street. This dimension is found concentrated in the image of the urban plinth, forming relationship between building and street's pavement. Often, the urban plinth boarding the street forms a continuous surface with horizontal level of the street's pavement, a two-way overlap, the street going into the building or the building going out into the street.

Based on this concept further study will attempt to identify several ambiences characteristic of the contemporary urban design street.

## 3 METHODOLOGY

There are two trends: the first is returning to the city's traditional values and lifestyle of pre-industrial city, the second is the one that is in the contemporary avant-garde and is concerned with solutions that open up new paths and adapt to irreversible changes. The main research topic is about finding a typology in the way that the concept

of urban ambiance is operated in the current practice of urban design and architecture. This target is achieved using several intermediate steps, first studying a large index of international examples and second, trying to approach in a personal manner a creative way to classify this topic difficult to explain and even more difficult to measure.

## 3.1 The hypermodern continuity

The main 'anchors' of this investigation are:

- 'The principle of thinking the hypermodern continuity' – it generates the ambiance of continuity in four hypostasis. First is the continuity as a shell, buildings that becomes extensions of their surroundings. Second is the continuity as the negative of the discontinuity, the limit, and barrier transforms in to the link, architecture as nodal intensification of landscape and infrastructure. Third is the continuity of coexistence, employing materials in new and unseen configurations. Fourth is the continuity thru transparency, modulating space, material and light as dynamic constellations.

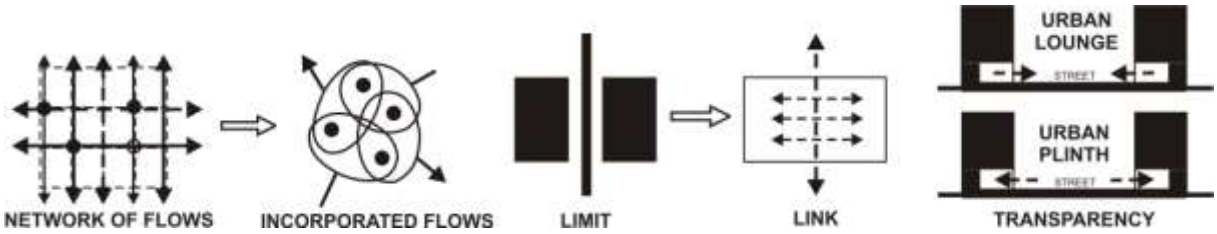



Figure 2: The abstract representation of the three hypostasis of the ambiance of hypermodern continuity: the shell, the link and the transparency in urban plinth. Source: author, 2014

- 'The principle of continuity by hybridization of two entities' – it implies three hypostasis. The first is hybridization of masses. The malls are moving back from their out-of-town locations in order to connect more closely with existing urban neighbourhoods. In the process, their alleys are starting to adapt to the new environment by opening un into-sometimes even becoming a kind of extension to – the urban streets. Second is the hybridization of the levels. Deforming the city floor not in plan but in section potentially turns the seemingly inevitable separation of different floors into a continuous experience, while ending in the same time the domination of spatial orthogonality that have ruled the architecture. Third, the hybridization between the horizontal and vertical. Rethinking strategic relationship between street and building by negotiating the transversal dimension and ensuring the continuity of flows vertically but also horizontally.

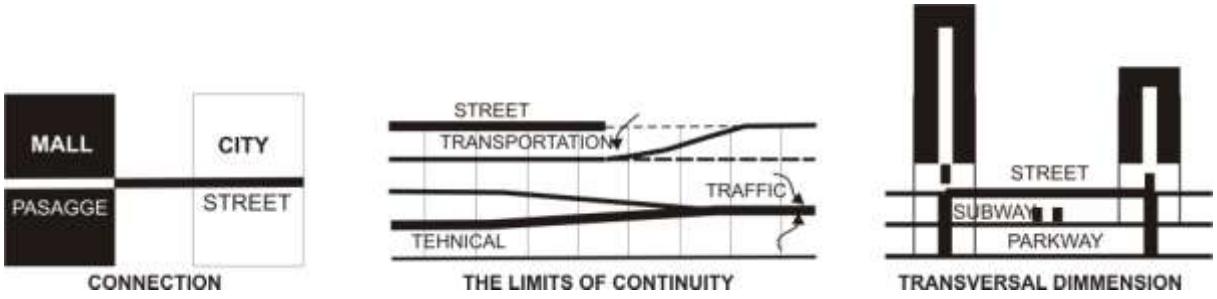
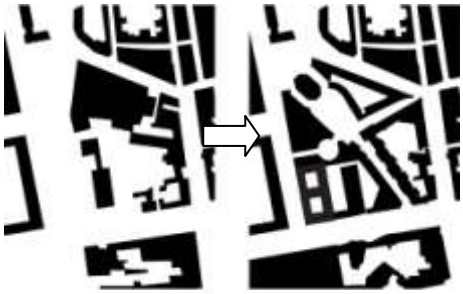
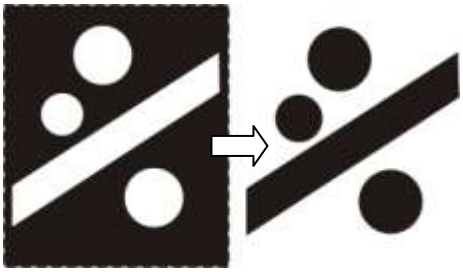



Figure 3: The abstract representation of the three hypostasis of the ambiance of hybrid continuity: the connection between mall and the commercial street from the traditional fabric, the extension underneath the city floor and the urban plinth as strategically node in the intensity of flows. Source: author, 2014

## 3.2 The symbolic-cultural continuity

- 'The principle of manipulation of the void'– it can be attended in two modalities. It refers to the symbolic-cultural ambiance and has two stances. First creates identities in a symbolic manner sculpting new continuities in an existing urban fabric. The second is based on elimination rather than addition by scooping out forms from a solid block.





***existing*** ***proposed*** ***existing*** ***proposed***

Figure 4: Examples for the symbolic-cultural continuity: *1. Rob Krier, high density in residential developmnet in the central area of Haga; 2. Rem Koolhaas, high density in residential developmnet in Almere,* source: *www.sjoerdsoeters.com, www.oma.com*

## 4 RESULTS AND CONNECTIONS

The present research helps the understanding of the contemporary continuity as seamlessly integrating architecture, landscape and urbanism. Contemporary avant-garde architecture might seem to have nothing in common with Modernism. But is today's architecture based on a different paradigm in respect to its early-modern counterpart? The ideal of continuity is not in the first phase of its emergence in urbanism and architecture. The difference consists in that the modern projects had managed to banish the street from urban design manuals, today's hypermodern projects seem to rediscovering it and to be seeking ways to give it a new continuity. The modern ideal of a continuous city floor is again upfront, but this time instead of dissociating ground from buildings, the hypermodern continuity seems to merge them into a seamless whole.

Seamlessness therefore expresses the spirit and the space of our era. As long as we can reach any destination in the world during all the 24-hour process it reflects the emergence of the contemporary ideal. The ideal of a space without limits and temporal frontiers where the most important thing is the connection with the global net of information flows of energy and money, the internet.

The risk is the absence of any way out and imposes limits in the street continuity. It relies on a technical apparatus that can function both as obstacle and as facilitator. Escalators and elevators can break down creating new discontinuities that can be subtler and more important than the old ones.

By all means, weaving together the disjointed parts of the city, the hypermodern continuity is the key theme of the master plan that creates cross connections and cross views between different neighborhoods in the contemporary new vision that inspire the architects, designers, businesses and urban planners.

Folding space into space, hypermodern continuity draw landscapes into buildings, streets into façades, inside to outside. Transformative tectonics set spaces, planes and bodies into unforeseen relationships that challenge conventional topographies and spatial codes. An architecture of trajectory and momentum, which responds to the specificities of the local context and the possibilities of engagement.

*Figure 5: Examples for the seamlessly integrating architecture, landscape and urbanism, Plasma Studio, landscape urbanism collaboration, Xian, China, The creativity pavilion, source: http://www.plasmastudio.com/work.html*

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# SIR NORMAN FOSTER - A GREEN LINE OF SUSTAINABILITY THROUGH STAR ARCHITECTURE

**Mihăilescu Ştefan, Assist.Prof., Arch PhD**

*Faculty of Architecture, Ion Mincu University of Architecture and Urbanism Bucharest, ROMANIA*
*stefan.mihailescu@freedesignstudio.ro*

**Abstract**

Taking a very close look at the buildings completed in the last years, one can definitely come to the conclusion of those being influenced by three elements: new materials, the experience of new shapes, and the employment of some sustainability.

Today, Star Architects are called to bring more aesthetic and practical value based on design knowledge, while mediating the relationship between the developer and the existing legal framework, not least for the publicity provided by their names.

Star architecture and sustainable architecture share the same moment when starting to be world wide known through the media, in the 1990s. From this point on, the two separate, although a number of elements that define sustainability are taken over by buildings searching to provide the status of star architecture. Unfortunately, the main expression that defines star architecture is novelty, and for such buildings the image is the most important element, so that on this image context fails to reveal its influence. Star architecture must stand out, there's no benefit when approaching an existing current, but on the contrary, it has to set up a particular movement, to generate new architectural canons. In terms of design, it is very difficult to relate to a given context when the focus is on standing out. This aspect largely justifies why star architecture slightly approaches the principles of sustainability, and when is doing it, only takes over those elements that are efficient, such as affiliation to energy certification programs.

Between the two types of architecture we found totally different approaches, in the same time we found that are conceptual separation and still some directions of integration by components. I have researched the approaches the architect Sir Norman Foster with his steady course towards architecture with its own identity, with a great force of expression and we found the constituents of a sustainable approach as a green thread running through the entire portfolio of great buildings. An example of this fact is the following series of buildings that integrate large area of greenhouses on several floors of office space and the natural environment: HSBC Building (Hong Kong), Commerzbank Tower (Frankfurt) and 30 St. Mary Axe (London).

By studying the contest for the office building at 425 Park Avenue, I found a very interesting fact: even the investors came to appreciate a sustainable approach that is supported by the great care for the building users. Between images and graphics with a maximum impact force, the latter option was oriented toward the proposals that focus on good relations between interior spaces, good lighting and abundance of public spaces. I believe that this example is promoting a new element, namely the increased interest of investors for a well "inhabited", "experienced" and used, linked to the sustainable design of buildings.

One thing that clearly defines architecture is the ability to bring innovation into a wide domain and to keep up with the ideals of the society holding it. Theory is always the core of

innovation, developed as a basis for the architecture design, theory that is found both in star architecture and sustainable architecture.

As a conclusion, “ultimately, clean energy is less energy. Alternative-energy alchemy has so greatly consumed the public imagination over recent decades that the most vital and durable environmental essentials remain overlooked and underfunded.” [1]

**Keywords**: architecture, sustainability, energy, eco-centric, techno-centric, technology.

## 1 SUSTAINABLE ARCHITECTURE AND STAR ARCHITECTURE

We chose to comment the relationship between sustainable architecture and star architecture for several reasons: the two types of architecture became widely publicized in the same period of time, and are defined either by uniqueness, iconic design on the one hand and by the architecture need to adapt to a new society culture, to the proper relationship between man - nature - economy, witch is more reflected in particular by reducing energy consumption. Between the two types of architecture we found totally different approaches, in the same time we found that are conceptual separation and still some directions of integration by components. I have researched the approaches the architect Sir Norman Foster with his steady course towards architecture with its own identity, with a great force of expression and we found the constituents of a sustainable approach as a red thread running through the entire portfolio of great buildings. An example of this is the following series of buildings that integrate large area of greenhouses on several floors of office space and the natural environment: HSBC Building (Hong Kong), Commerzbank Tower (Frankfurt) and 30 St. Mary Axe (London).

Broadly, there are two sustainable currents in architecture, which are on diametrically opposed positions, despite the fact that their interaction may result in a much more acceptable model to everyone. It's eco-centric and techno-centric. The differences between the two trends are particularly true because of the way they are applied in architectural practice. Eco-centrism designers develop ambivalence between the aesthetic and environmental conservation. In the techno-centrist current, given the increasing specialization and complexity of design, only a small number of the architects manage to undertake an applied approach including environmental needs. Most of the architects are applying a technological layer over a normal building, from the moment they have convinced the customer to invest in green direction.

The techno-centrist architecture, broadly discussed in my doctoral work is dependent on good cooperation between specialists and a correct interpretation of all data entered into the system. In the examples presented in the research behind architects are multidisciplinary teams, specialized firms (Transsolar, Atelier 10 ARUP Associates, Buro Happold and Werner Sobek Engineers) able to relate and interpret the concept proposed by the realities of use. Following this approach results in a complex system which is then detailed down to the smallest detail by engineers and architects. The result is a building whose constituent parts are defining the architectural aesthetic and functionally relates to each other. This technology integrator role, participates and influences the design, and becomes a puzzle piece that can not be eliminated without affecting the whole.

## 2 LIGHT AND VENTILATION, THE EVOLUTION STORY

“Since Stonehenge, architects have always been at the cutting edge of technology. And you can’t separate technology from the humanistic and spiritual content of a building.” [2]

### 2.1 HSBC Building

The symbolic building of Hongkong and Shanghai Bank, was a first step for the architecture firm Foster and Partners to be present in the East, in Asia. The winning proposal presented a very strong image in terms of visible structure, a new image for an office building and persuaded because of a special relationship between the public and private area. “The tower is hollowed out to create an atrium like no other. It is topped by the array of mirrors that form its ceiling, eleven floors up, and serve to deflect the sunlight collected by the sun scoop fixed to the exterior façade down through the atrium and on to the floor of the plaza. A billowing glass curtain pierced by a pair of escalators keeps the banking hall climate controlled” [3]

This relationship becomes a starting point for future efforts in these proposals for office buildings. Sustainability applies in this case by a number of factors: the release of the ground floor, making a full height atrium building,

original interior lighting module, flexibility in partitioning and prefabrication framework. "The mast structure allowed another radical move, pushing the service cores to the perimeter so as to create deep-plan floors around a ten-storey atrium. A mirrored "sunscoop" reflects sunlight down through the atrium to the floor of a public plaza below – a sheltered space that at weekends has become a lively picnic spot. From the plaza, escalators rise up to the main banking hall, which with its glass underbelly was conceived as a 'shop window for banking'." [4]

Fig 1 - http://www.detail-online.com/architecture/topics/hongkong-and-shanghai-bank-ndash-10-questions-to-lord-norman-foster-006642.html

Interior lighting module is linked to the size of the atrium. A full height atrium for the whole building can lead to the emergence of air currents which adversely affect the use of adjacent spaces. The entire lighting system is based on the network of mirrors that take the upper control sunlight and directs it to the lower parts. "This is the famous "sunscoop" a huge periscope projecting sunlight onto the banking halls and through the glazed underbelly to the public plaza beneath the building. It has two main components: a bank of flat mirrors attached to the south side of the building at level 12 and a curved canopy of convex mirrors suspended over the atrium." [5]

This system is not perfect, various repairs needed but the concept and attention to lighting interior spaces were refined through subsequent projects. The project presented has the advantage to build a innovative ways to design office buildings.

## 2.2 Commerzbank, Frankfurt

I considered necessary to present this example in order to illustrate clearly the way in which the sustainable design criteria (using controlled natural ventilation to reduce energy consumption, including a conceptual area of atriums within the building to bring as much natural light, the ability to open windows to the outside) influence the design of a building at all levels from the concept to the building phase. The main concept visible in Commerzbank sections, the atrium and greenhouses on four levels height play a major role in designing of the integrated system of ventilation and natural lighting of all office space, and it is visually expressed in the facade and from structural point of view required the release of public areas from beams and columns (structure). The neighbouring offices and the greenhouses are divided with glass walls on metal structure in order to take advantage of natural light from the central atrium and shading systems in case of too strong lighting. This concept of transparency influence both the perception and use of space by removing psychological barriers caused by the opaque divisions used by now for separating the employees.

In the first conceptual drawings, the atrium represented a continuous space on all 60 levels, enjoying ramifications space represented by greenhouses that allow natural ventilation. Along the way, it was necessary a fragmentation of the atrium's height due to risk of too strong air currents. For this reason, the atrium is cut off of from 12 to 12 levels, each partition operating independently at the same time linked to the existing environment in the greenhouse. The greenhouses are located on the front, gradually passing on a facade height of another and allow natural light to create additional office space and the pressure that is different in each room combined with the air currents in the atrium is creating a complex and well controlled ambient. This rotation system for the

greenhouses was so effective that we find it reused in a much more modern London project, named Swiss Re of the same architect.

Fig 2 - www.fosterandpartners.com

## 2.3 St Mary Axe / Swiss RE / The Gherkin

The form of the building was parametrically generated according to three aspects: generating a minimum area of curtain walls, reducing the wind generated loads and reducing its impact on pedestrian level and generating a public space. The Thanks to computer aided design applications has been generated which has a minimum burst through the surface wind round a variable section height less based to occupy land and widest least the 17th floor to change the scale which is seen from the pedestrian building.

A sustainable building must report it self to the cardinal points, that is correlated in terms of differently facades orientation and solar protection, but for the high-rise buildings of 30 St Mary Axe which is curved and aerodynamic shaped, this difference in the façade was not possible. The indoor ventilation is facilitated by a system of six triangular wintergardens on each level and on the each level they are mutually reversed by 5 degrees resulting in a spiral system atria. On the façade, these elements are represented with smoked glass atriums for the sun protection, which in turn is an important element of design. On each level, the six atriums share office area in rectangle with sides ranging from 6 to 15 m depending on the floor, bringing light and space dynamics. At the inside the positioning of the wintergardens creates separations between office areas, which reduce electric lighting use. The inspiration for these kinds of spaces is based on building designed by Buckminster Fuller like Climatroffice, through the hanging gardens of Commerzbank Tower.

Figura 3 - http://www.archdaily.com/406794/the-gherkin-receives-ctbuh-s-inaugural-10-year-award/

### *2.3.1 Sustainability achieved through applied technology*

The facade is made in double facade system, with the outer layer of two sheets of glass, 1 -1.5 m space between the inner and outer face system, parasolars and a layer of clear glass. In principle the double façade system maintain the existing indoor temperature, and allows the indoor air to discharge heat to the upper level. [6] The diagrid type metal structure is masked in a triangular shape made of aluminium, in which are inserted the mechanisms to extract the stale air at the top and bottom air inlet.

The ventilation system is partly based on natural ventilation up to level 32 (maximum utilization estimated annual is 40%), carried out under very clearly defined outdoor temperature (over 20 ° C and wind speed below 10mph) and a mixed mechanical ventilation system. In the atriums, the BMS may refer to climate change or pressure from within and order partial opening of the windows for spaces ventilation.

The sharp curve shape of the building was carried out by means of diagonal metal structures, called diagrid. It is derived from the intersection of a tubular steel structure, which provides strength without the need of traditional ceilings horizontal structures. This type of structure resists well to wind loads and the particular form of the building is supported by a number of 36 intersecting metal columns that are connected at every level, having a total weight of 2,500 tons.

The architect Sir Norman Foster interest for reducing energy consumption is published in his speech in the British Parliament hold at 29 January 2003: “Buildings consume half the energy produced in an industrialized society; transport and industry, the infrastructure, the remainder. Given the link between energy production, pollution and global warming, the threat to the fragile planet's eco-system, there are strong arguments for reducing the energy demands în building and infrastructure. The quest for a greener, more ecologically responsible design is not about fashion, but about survival.” [7]

# 3 SUSTAINABILITY IS SERVED BY USING NEW STRUCTURAL CONCEPTS

## 3.1 London Stanstead main terminal building

In the case of London Stanstead main terminal building ( 85,700m2) the most important feature is a gull-wing profiled continuous roof canopy which is carried by tubular steel structural known by the name of “trees” in which are situated the most important services and controls. I took this example because it is a very important step in releasing the constructions from the massive structural elements and of the disadvantages mainly related to ventilation systems, air treatment, etc. The proposed structural module, close to another very important example (Renault Distribution Centre, Swindon), is using a highly transparent metallic structure. An overview of the structural system is made in this citation “overall, the undercroft is 26.3 ft (8 m) high and the passenger concourse level reaches another 39.4 ft (12 m). In plan the terminal is based on repetition of a 59 x 59 ft (18 m) grid of 11 x 11, or 121 equal bays. Thirty-six structural trees sit at the centers of alternate grid squares, 118 ft (36 m) on center and 59 ft (18 m) high from undercroft floor to roofline.” [8] Inside this steel structures are hidden tratatare air systems.

This has been possible because the initial concept that buried the technological levels and largely delivered the terminal directly for the users.

Fig 4 - http://commons.wikimedia.org/wiki/Category:London_Stansted_Airport

“Service distribution systems are contained within the 'trunks' of the structural 'trees' that rise from the undercroft through the concourse floor. These trees support a roof canopy that is freed simply to keep out the rain and let in light. Entirely daylit on all but the most overcast of days, the constantly changing play of light gives the concourse a poetic dimension and also has significant energy and economic advantages, leading to running costs that are half those of any other British terminal. Energy efficient, environmentally discreet within its rural setting, technologically advanced yet simple to use and experience.” [9]

## 3.2 The Hearst Building

The city's sustainable building, Hearst Tower, was the second building in the city to be certified with the Gold LEED (Leadership in Energy and Environmental Design) rating in 2006. The main reason for this certification was the innovative highly efficient structural system consuming 20% less steel material than a conventional one and because of interior fit-out and systems.

From my point of view a very important aspect is way in which the new building relates to the existing one. In terms of construction, keeping the exterior perimeter walls was a high effort. Basically in an existing interior were introduced structural frames that support the entire tower. The impressive architectural aspect is related to the transformation of this space into a large sized lobby and the insertion of a glass roof that provides transparent image for the tower that rises to the sky. Steel beams rule the interior of the old building, sprouting upwards at the same diagonal angle as the beams on the upper part of the Tower.

Transparency and space gained freedom contrasts sharply with highly visible structural strength. At the Tower's sixth story, the existing and the new form are in contrast but in the same time connect with one another. The first Hearst Tower, raised in 1928, is constructed from limestone, shaped with fluted columns and with some series of rectangular shaped windows. The new 46-story Hearst Tower in a powerful contrast, grow from the stone base. The forms don't have much in common, nor should they. Rather than demolishing the original structure and starting anew, the Tower pays respect to its past by literally building on it with contemporary forms and shapes.

Fig 5 - www.fosterandpartners.com

“Using 26% less energy than a building constructed to normal code, the Hearst Headquarters features a distinct, thermal efficient diagrid design that provides an open interior with a panoramic view over Central Park. The building’s unique design saved 2,000 tons of steel, involved 90% of steel made from recycled material and required only 10% of all materials to be imported during construction, reducing overall cost and emissions.” [10]

## 3.3 425 Park Avenue Office Building

By studying the contest for the office building at 425 Park Avenue, we found a very interesting fact: even the investors were coming to appreciate a sustainable approach that is supported by the great care for the building users. Between images and graphics with a maximum force, the latter option was oriented toward the proposals that focuses on a good relations between interior spaces, good lighting and abundance of public spaces. We believe that this example is promoting a new element, namely the increased interest of investors for a well "inhabited", "experienced" and used, linked to the sustainable design of buildings.

The winning building, looks to link two different periods of time, the façade borrows from the modernist towers in the vicinity, and add a plus in modernity mainly due to the visible structural system that allows large openings. Because of to the structural system most used, a large majority of spaces can remain outdoors with perimeter support. To provide a free space and with the possibility of restructuring it was necessary to obtain a

well suited relation between structure, installations and the properly lighted area, which was a challenge for the designer and structural engineering team.

Fig 6 - http://www.e-arhitect.co.uk/new-york/425-park-avenue-tower.

The relationship between the building and the city takes into account the need to achieve a public space on the ground floor and the obligation to remove surface built on site to allow pedestrian access from multiple directions. To create a welcoming space on the ground floor, it is raised further, becoming a permeable public base. The quality of interior space and geometry of the facade are improved by segmenting the office space buildings parts with two rows of open gardens, that concept allows users access to a landscaped space for relaxation and visual segments the building from the outsider point of view.

It can be seen in the case of this competition, involving both interested in promoting sustainability architects and architects totally uninterested in the subject, that „ Among the core elements of green standards, energy, water, and materials efficiency remain the primary goals, with sustainability and pollution avoidance secondary." [11]

## 4 CONCLUSIONS

In the design and construction culture, innovation has long been linked to aesthetic aspects novelty. Through sustainable design we are forced to innovate, to change language elements in accordance with the requirements of cultural society and to overcome changes made just for fact that its looking good in picture.

My opinion is that neither egocentric architecture nor the technocentre can not be reduced to an aesthetic play with different architectural components, the design remains a complex issue that must interact with energy efficiency factors in a consensual way, plus the aesthetics of the building should be influenced by cultural aspects.

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# NOVELTY VERSUS INNOVATION

**Vlad Thiery**[1]

[1]*Ion Mincu University of Architecture and Urbanism Bucharest (ROMANIA)*
*vladthy@yahoo.com*

## Abstract

In a time when difference and individual expression are highly valued, oddly we are more and more part of a culture of copy. Due to the desire for originality, which comes from the need for immediate recognition, contemporary architecture is deeply marked by the endeavour to create unique objects and spaces. But the novelty that results, regardless the place or cultures where they are located, are so very much alike. Embarked on a feverish search for novelty and personality, contemporary architecture paradoxically generates clones.

The theories regarding innovation went through some important changes in the last fifty years. In science Thomas Kuhn's model of scientific revolutions challenged the one that saw it as a process of continuous accumulation, while in business the entrepreneurial innovation model gained ground. Nowadays, people are talking more and more about a different way of thinking, of seeing things, and this "thinking out of the box" approach is not happening now only in the creative business or art but in almost every area of activity.

Architecture claimed its independence from the old formal constrains since the modernist manifesto. And, due to the changes occurred in the postmodern society it seemed that architecture could free itself from any kind of dogma. With no more style or ideology to work within, architects either chose a commercial orientated and populist view or a critical vanguard like approach. While the former view is too cautious to generate innovation, the latter is too busy to create its own dogma with all its related constrains, in other words to build its own box to live in.

**Keywords**: Innovation, paradigm, entrepreneurship, thinking out of the box, conceptual framework

## 1 DESPERATELY LOOKING FOR NOVELTY

The Post-Modern society is characterized by a continuous search for novelty. This can be regarded as a result of the need for difference and individual expression of the contemporary man. The restless search for the "new and unique" can be seen in art but more than this in fashion, in science but more than this in technology. Things that have a commercial value i.e. that are objects of a commercial transaction based on supply and demand are more likely to "act" under the influence of this appetence for novelty.

This trend is making quite a pressure on creative industries, and architecture is no exception to this. But despite the search for originality, many of the contemporary practices in architecture, and also in industrial design, are producing a culture of copy. Looking for novelty and individual expression, contemporary architecture builds, more often than not, clones.

This can be due to the fact that in this desperate search for novelty the market mechanism seems to enforce, the real innovation is mostly neglected. Most of the time, "the new" is taken for innovation.

But before talking about innovation in architecture and where we might look for it, it could prove useful to see how innovation is regarded today.

## 2 HOW INNOVATION WORKS

Most of us are thinking of innovation in terms of science and technology. The innovator is generally regarded as an eccentric scientist who, if he or she is lucky and, of course, brilliant, is hit by inspiration and, after shouting "Eureka!", starts to write a theory that will change the world. But it seems that things are not at all like this.

The modern theories on innovation look at it as a much more complex process where accumulation and observation are playing a critical part. Innovation is neither coming out of the thin air and, nor "out of the blue" as the expression is.

Two theories changed the way of thinking regarding innovation in the second part of the twentieth century. One is focused on innovation in science, the other on innovation in management.

**Innovation in science**

The general view about science at the end of the nineteenth and the beginning of the twentieth century was influenced by Auguste Comte's doctrine of positivism. Science was regarded as a process of continuous accumulation, corresponding to a linear development in history [1].

But in 1962, Thomas Kuhn, a trained-to-be physicist who turned to the research on history and philosophy of science, published an essay called "The Structure of Scientific Revolutions" which became influential in but also outside the academic field.

In his work, Kuhn suggested a pattern in which scientist are usually working within a paradigm – a model generally accepted by the scientific community. According to Kuhn, paradigms are "those scientific achievements universally acknowledged, which, for a period of time, offer problems and model solutions to a community of practitioners" [2]. Due to this model the research area and purposes are defined, allowing the scientist to focus on some particular matter without bothering to define, each time, the general framework.

Within the paradigm, the so-called normal science is practiced as the "research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice" [3]. In the normal science framework, the research works, according to Kuhn, as puzzle-solving. The scientist is trying to solve particular problems within the frame of the paradigm, knowing that for each problem – as defined by the paradigm - there is an answer, be it easier or more difficult to find. Having those certainties, the scientist is free to focus on a somehow better defined research with an increased efficiency and, finally, with better results.

The results of the research confirm, in most of the cases, the paradigm. The ones that do not are rejected as being errors in observation or exceptions. When the results that are not confirming the paradigm reach a critical mass, i.e. when anomalies accumulate, there is a crisis in the scientific field, a crisis that will ultimately lead to a change of paradigm able to explain the anomalies. Thomas Kuhn called these moments "scientific revolutions".

The new paradigm the scientific revolution produces is not accepted from the very beginning by all the members of the scientific community. The ones most likely to accept the change are the ones outside the narrow community or the newcomers. Generating a new paradigm is a risky enterprise but it is not something coming from nowhere. It is rather the audacity to name some things that are intuited already by a part of the scientific community.

The changes in paradigm do not occur so often in science and they represent a quite noticeable rift within the scientific field, because the new paradigm and the old one cannot be compared due to their incommensurability. This means that we cannot look at these paradigms in terms of "improved versions" because the new paradigm cannot be evaluated in terms of the old one and the other way around.

To resume, Kuhn's model of scientific revolutions involves a usual way in which scientific activity goes, called normal science which works within the accepted paradigm and in which the scientific work is seen as puzzle-solving. When the paradigm is proven to be no longer able to explain the results of the scientific activity, a revolution occurs and a new paradigm is conceived.

**Innovation and Entrepreneurship**

The management theoretician Peter Drucker developed a model of economy based on the entrepreneurship and management innovation. His views are founded on Joseph Schumpeter's theory on the economy based on entrepreneurs and their capacity to innovate and on innovation seen as "creative destruction". This

entrepreneurship model was in contradiction with the classical theory of John Maynard Keynes focused on getting as much as possible from the existing resources and establishing a balance [4].

The main thesis in Drucker's work Innovation and Entrepreneurship is that "the new technology" responsible for the economic development of the United States from the sixties until the eighties – development which seemed to come in conflict with all theories – is not technological but entrepreneurship-based management [5].

Drucker resumes the French economist J. B. Say definition of the entrepreneur as the one who "shifts economic resources out of an area of lower and into an area of higher productivity and greater yield" [6] and emphasize the main characteristic of the entrepreneur to search and exploit the opportunity: "This defines entrepreneur and entrepreneurship - the entrepreneur always searches for change, responds to it, and exploits it as an opportunity" [7].

The innovation is not just an idea or an invention. In order to be an innovation, the good idea must be able to be implemented and prove its viability when implemented. According to Drucker, innovation based on entrepreneurship "can be presented as a study discipline, can be learned, can be practiced" [8]. Therefore, he elaborates on the concept of systematic innovation which "consists in the purposeful and organized search for changes, and in the systematic analysis of the opportunities such changes might offer for economic or social innovation" [9].

Drucker's next step is to identify seven sources of innovation. Four of them are to be found within the business so they are more likely to be seen by the ones working within the field. They are in order:

The Unexpected: unexpected success, unexpected failure, unexpected external event.

Incongruities – between reality as it actually is and the reality as supposed to be.

Process Need

Industry and Market Structures that take everybody by surprise.

The other three are referring to changes outside the business or field:

Demographics: changes in demographic structures.

Changes in Perception – mostly related to changes in lifestyle.

New Knowledge – both technological and non scientific. [10]

Basically, what Drucker proposes is a system of searching for innovation opportunities together with some entrepreneurial strategies. Systematic innovation is based on a continuous and organized search for opportunities that is to be done by the systematic observation of changes inside and outside the business.

**The Box. On being inside / outside**

The book "Whatever You Think, Think The Opposite" by the creative director Paul Arden, starts by presenting the Fosbury Flop – a technique invented by the athlete Douglas Flosbury for the high jump – that, when used in 1968, raised the Olympic record from 1,72 to 2,24 meters. Basically, what Fosbury did was to change the Western Roll – the technique used by that time which involved a jump facing the bar -with a jump on the back. And Paul Arden's book goes on, presenting examples of successful enterprises achieved by not using the right way of doing things, to conclude with the advice: "Start taking bad decisions and it will take you to a place where others only dream of being" [11].

Paul Arden's book is a rather radical expression of a trend of thought from the creative industries - that the success can be achieved by doing things different. And this idea is close to a wide-spread trend in management: to think outside the box.

Thinking outside the box is a metaphor for thinking differently, seeing things from a different perspective or in other words having a fresh view. To some extent, this was the idea both in Thomas Kuhn's model of scientific revolutions and in Peter Drucker's systematic innovation. To think outside the box means to be able to get out of the frame that people artificially build around a problem and its possible solutions.

Somehow, the box seems to remind us of Drucker's paradigm. And, if we take another step back for a wider view, the box can be a metaphor for a way of seeing things or doing things, for a manner and, why not, for an art style. Both the paradigm and the style act like an "umbrella" for the scientist respectively for the artist. Protected by this umbrella, one can focus on his – maybe small and unspectacular – but in most cases essential work, without having to define each moment the whole universe.

The box, being it a paradigm or a style, can also be seen as a safety net if we consider that going along with the general trend is a safe bet. This way we are getting closer to the management approach about entrepreneurship innovation and its risk. But, if we are to give credit to Peter Drucker, it seems that for an entrepreneur is more risky not to innovate on a medium or long term planning.

Considering these, it looks like being inside the box can provide one with the conditions needed for a decent practice, depriving him or her, on the other hand, of the opportunities for a real innovation. So, if being inside the box can be safe but also rather restrictive, how is it to be outside?

**Breaking the box**

"The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore, all progress depends on the unreasonable man", once George Bernard Shaw said. Positioning oneself outside the box involves risk taking as a price to be paid for a wider view, less constrains and potential success. But, once again, if we listen to Peter Drucker the risks associated with systematic innovation are less than the one involved by the mere optimization [12].

It seems that at this juncture Kuhn's model from The Structure of Scientific Revolutions and Drucker's from Innovation and Entrepreneurship are pointing different directions. While in science, the every day puzzle solving is prerequisite for any change of paradigm to be, the management model sees the entrepreneur as someone who has to be in an unceased search for innovation.

A question arises: between the visionary and the rather conservative approach, where the architect should be? And, as usual, the cautious answers come out: "somewhere in the middle" and "it depends".

**Listen to the client / Follow the client demand**

A cautious approach, but definitely market-orientated can be "follow the client demand". A thoughtful view an architect can have regarding his mission can be stated as "listen to the user". The latter statement can be associated with participatory design and all the good things that come with it, while the former is usually the populist approach.

**People and the need for faster horses**

The straight answer to the most obvious need is the characteristic of what is called commercial or populist architecture. It is a safe approach for construction business which involves pretty large investments right from the start. But literally following people's request with no vision whatsoever results in no creativity and no value added to the architectural work, and in the end, of doing quite the same thing without much chances for a real improvement. As Henry Ford stated: "If I had asked people what they wanted, they would have said faster horses."

**The paradox of the needed innovation and its commercial failure**

It seems that if there is a need that can be fulfilled by an innovation in the design of an object or a building, this innovation will be successful or even more will be a "commercial hit". Unfortunately, things are not always what they seem.

The market mechanism sometime has a strange logic. A revealing example is provided by Victor Papanek in his book Design for the Real World. Talking about the lack of social involvement in the design process, Papanek is presenting some problems personal computers had in the eighties because the ergonomic issues were neglected in their design. The listed problems could be solved with an increase of only 8,5% of their selling price and only 5% of the manufacturing costs. Although, due to market considerations on the paradoxically risk of not being able to sell a product better than the ones of your competitors, the improvements were only made in time [13].

# 3 INNOVATION IN ARCHITECTURE

### The end of style

After the dissolution of modernism, there was no box left for the architects to be in. Since the criticism has stated that modernist dogma was an obstacle between the user and architecture, it looked that once the ideology forsook, there were no more reasons left for this split to persist. Also, there was no threat for another ideology to rise again since Lyotard stated the society mistrust regarding the "grand narratives".

The end of style, proclaimed by the modernists themselves, finally seemed to become reality under the postmodern condition. And this also seemed to be the end of all boxes in architecture.

The commercial architecture exulted under this new condition and started to build luxuriant structures as it happens after a long period of austerity. The only constrains considered were related to the budget and the only criteria to look at were those derived from the popular taste.

But the elitist architecture had not said its last word yet.

### Building the Box

However, the box always holds an almost hypnotic attraction on people. With no more styles left, architects began to build new paradigms to work within, even though they claimed they were trying to deconstruct architecture in order to expose it as a subject of oppression in a psychoanalytic key.

With no more grand narrative left, critical architecture produced particular boxes which worked like conceptual frames – concepts as they were called. The new boxes were governed by rules imported from different areas like philosophy (Derrida's deconstruction was largely the favourite), politics or sciences.

This need for a conceptual framework to design within is in close relation with the need for legitimacy. And the only way to respond to this need is through an objective process. It is possible that this objectivity commandment has roots older than Modernism, going all way back to the Enlightenment thinking in the reign of rationality.

Thus, critical architecture started to work within new and sometimes different conceptual frameworks. Each leading architect of the post-modern elite built his or her own box (or concept as they prefered) which provided the problem and the solution in the same time, both of them subject to some abstract ideas. The concept becomes a system to deliver the new, as Michael Speaks explains:

"Forged by an all-knowing vanguard, manifestos are abstract principles meant to govern the production of 'the new'. Vanguards, with their five points, seven principles and ten theses for a new architecture, draw a line that leads straight from the manifesto to 'the new'." [14]

The risk when embracing the vanguard manifesto, beside its abstract nature that estranges it from the user, is its appetite to become a dominant rule. And this happens the more so as the practice area is opened to experimentation, as in the case of academic field: "For in schools, the manifesto degrades into style and then even more rapidly into dogma. Rather than pausing briefly to enjoy its temporary celebrity before moving on, architectural style more often than not hardens into dogmatic adherence." [15].

### Looking for opportunities

As I have mentioned at the beginning of this text, we are in constant search for "new and unique". If we were to leave aside the somehow odd postmodernist phenomenon of box building and look at architecture as business through Drucker's theory, how can we be innovative in the contemporary architectural practice? What are the chances of being "new and unique" between all those different concepts which are released on the architectural market? Where to look for opportunities to innovate?

Alejandro Zaera-Polo provides us a method to discover opportunities for the contemporary practice. In his article A World Full of Holes [16] he is setting some guidelines which, according to him, can allow us to build a map of the contemporary practice, or, if I may say, of the conceptual-frames or boxes existing on the market.

The map obtained can be like a fabric, like a net with dense and thin areas, of solid and empty parts, a world of worlds with some room to be in because it is a world full of holes.

As soon as we draw the map (Zaera-Polo gives us precise instructions on how to do that) we can choose a niche – that is to say an opportunity if we act as entrepreneurs – and settle us in.

Or, being seek of all this, we can start to help people build, as our (humble) job used to be.

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# A RENEWED CONTROL ROOM FOR THE CONCERT HALL OF RADIO ROMANIA

**Radu Pană[1], Marius Smigelschi[2]**

[1] *"Ion Mincu" University of Architecture and Urbanism (ROMANIA)*
[2] *"Ion Mincu" University of Architecture and Urbanism (ROMANIA)*
*rpana@uauim.ro, smigelschi.marius@gmail.com*

**Abstract**

T4S, the old Control Room of the "Mihail Jora" Concert Hall of Radio Romania was completely renewed to house for the first time in Romania a surround 5.1 recording system, beside the traditional stereophonic one.

The acoustical qualities and requirements of control rooms being completely different from the performance or audition ones, the acoustic environment must be, in all details, very well controlled. The initial trapezoid form of the room and a modified sloping ceiling helped to avoid harmful room modes, but a complex geometric (2D + 3D models) and wall treatments study was performed to ensure only the necessary sound reflections to reach the listening position.

The monitor loudspeakers for the "stereo" system were built into the front walls, in a very complex three dimensional drywall type system, while the 5 + 1 surround loudspeakers are free standing on the floor.

The walls acoustic treatments consist of a combination of resonant wood perforated panelling, porous absorption and plywood panel absorbers, inclined at specific angles to control sound reflections. A special acoustic fabric lining unifies the aspect, also covering the entrance door. A large wood acoustic diffuser is placed on the wall opposite the speakers.

An innovative ventilation system allows the air to circulate behind the wall treatments, and through the perforations of the panelling and thus, no ventilation openings were visible.

Preliminary acoustic measurements during the works ascertained the necessity to add sound absorption for the middle and higher frequencies. After the necessary correction and completion of work the final acoustic measurement determined a remarkable uniformity of reverberation times and of the acoustic parameters.

**Keywords**: architectural acoustics, room acoustics, acoustic measurements, control room.

## 1 INTRODUCTION

The T4S control room was at its origins, in 1973, arranged in an existent room that initially accommodated the preliminary acoustic studies on a mock-up of the concert hall. Its main purpose is to monitor and record performances in the "Mihail Jora" Concert Hall of Radio Romania.

After more than 40 years of continuous operation with no significant improvement, the control room was outdated from every point of view.

The acoustical qualities and requirements of control rooms are completely different from the performance or audition ones. Not uniform richness of sound or envelopment is required, but

the best hearing conditions of the sound coming from monitoring loudspeakers, to the listening position: the sound engineer next to its working console ("mixer").

That is why the acoustic environment in control rooms must be in all details, very well controlled.

The traditional and well known "stereophonic" recording system with two loudspeakers and the listening position arranged in an equilateral triangle is still the most used for recordings and radio broadcasting. A new system, however, is gaining more and more interest: the surround 5.1 sound system, consisting of 5 loudspeakers round the listening position, plus a subwoofer for low frequencies.

The T4S control room is intended for the first time in Romania, to have additionally a surround 5.1 recording system, beside the stereophonic one.

## 2 CONTROL ROOM DESIGN

### 2.1 Acoustic Parameters

The parameters for the stereophonic system are specified by the European Broadcasting Union (EBU) in the "**tech 3276"** document (Listening conditions for the assessment of sound program material: Monophonic and two-channel stereophonic) [1]. For the T4S control room, the parameters had to be completed with the "Recommendations For Surround Sound Production issued by "The Recording Academy's Producers & Engineers Wing" [2]. The main requirements were the following:

- Background noise. Firstly, a control room must be a quiet one: the background noise should not exceed Noise Rating Curve NZ15 (in Romania CZ15).
- Early reflections. They are defined as reflections from boundary surfaces or other surfaces in the room which reach the listening area within the first 15 milliseconds after the direct sound. Such reflections preferably must be avoided. If not, the levels of these reflections should be at least 10 dB below the level of the direct sound.
- Reverberation field. Reverberation is the effect caused by multiple reflections from the boundary surfaces of the listening room, which reach the listening area after the early reflections. For T4S the recommended reverberation time, depending on the room volume, was around 0.3 seconds.
- Operational room response curve. It is defined as the frequency room response of the sound pressure level produced by the loudspeakers at any listen point. The tolerance limits (generally difficult to obtain especially at the lower frequencies), are +/- 3dB.

### 2.2 Background noise

The building heavy concrete and masonry construction, structurally separated from the Concert Hall building, together with the position of the room insures the premises for a low background noise. The only concern was related to the wall separating the control room to the adjoining corridor. A sound reduction index measurement performed during design stage revealed a rather high value: $R'_w (C;C_{tr})$ = 53 (0; –3) dB, similar to the one of a 25 cm thick brick wall. It was only needed to add two gypsum panels with mineral wool, along the lateral walls, as sound isolation improvement.

One could find further that a special attention was given to the air conditioning system.

## 2.3 Geometry

The making program of T4S began with an expertise study focused on clarification of the general form of the room, according to the relative positions of the speakers and the listening point.

The considered relative position of the speakers in relation to the listening position and the room was:

- the two stereo speakers and the listening position, located in an equilateral triangle with a radius of at least 3.00 m;
- the 5 surround speakers located round the listening position on a circle with a radius of 2.30 m

Several variants were studied keeping general symmetry and the listening direction along the longest axis.

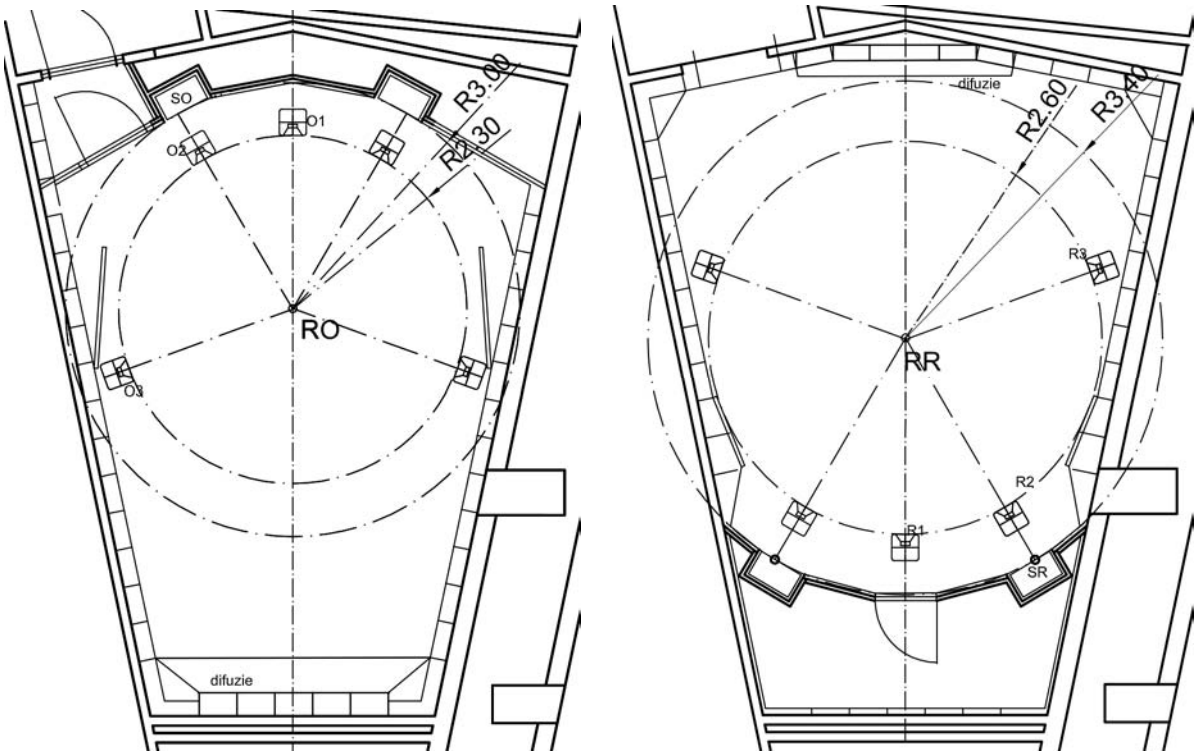


Fig. 1 The two main options for speakers and listening position layout

The selected option was the one with the stereo speakers placed opposite the entrance, with several advantages: surround speakers arranged in a larger radius, easier access, larger area for equipment racks and secondary listening places. As well, the general shape of the room with the speakers located in the narrowest area of the trapeze was useful because it tends to send reflections towards the back.

The initial trapezoid form of the room and a modified sloping ceiling helped to avoid resonant room modes that could accentuate some room frequency response and harm the listening conditions.

However a necessary detailed geometric study tried to avoid early (first) reflections at least for the important speakers in front of the listening direction (the 2 stereo and 3 surround speakers) and the lateral walls (Fig. 2).

The trapezoid shape was not enough to avoid such reflections therefore some lateral oblique surfaces were proposed. In the final version the surfaces farthest to the front speakers were discarded.

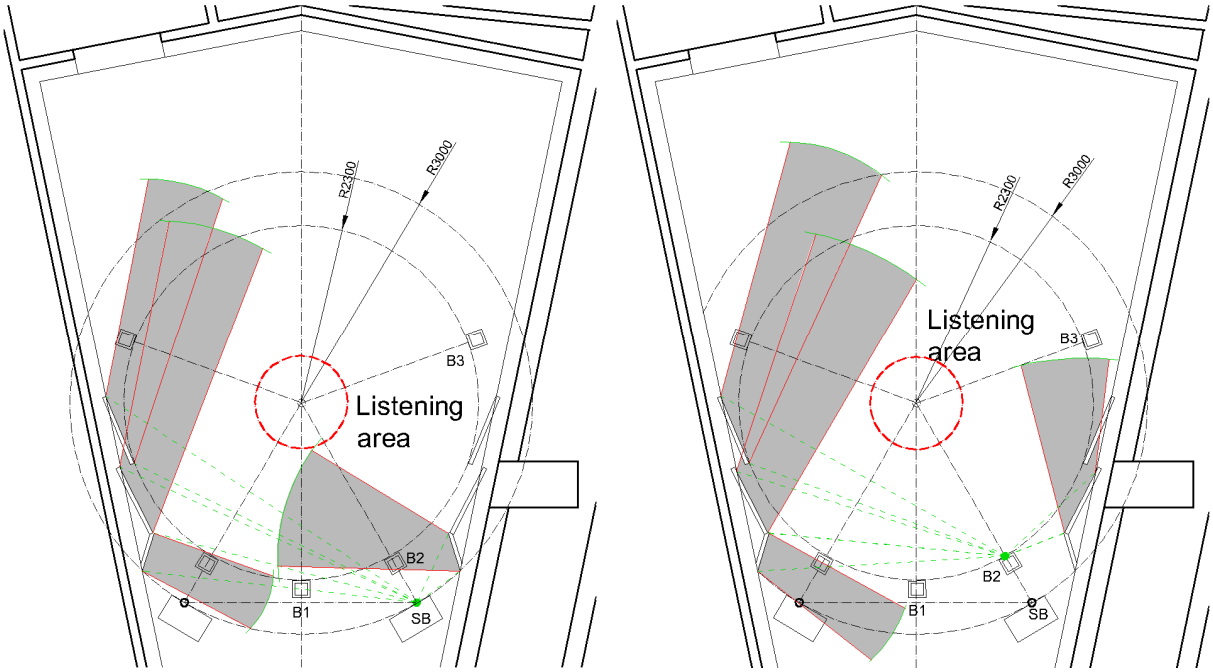


Fig. 2 Study of first reflections distribution – source Stereo Left (SB) and Front Left (B2)

In the vertical section, an added suspended panel was necessary in order to avoid first reflections from the ceiling.

## 2.4 Acoustic treatments

As in top level control rooms the monitor loudspeakers for the "stereo" system were built into the front walls. The "flush" mounting ensures that all the sound radiates only in a forward direction. Usually the loudspeakers must be very solidly mounted in a massive wall, but considering the existent conditions, the front wall was realized in a very complex three dimensional drywall type system.

The 5 + 1 surround loudspeakers are free standing on the floor or on the technical furniture at the recommended distances from the wall behind.

The design of the treatments was intended to fulfil the following roles:

- achievement of the detailed geometrical shape,
- obtaining the recommended reverberation time,
- allowing for the air conditioning a quiet and non-visible route.

The walls acoustic treatments are treated uniformly in three horizontal registers having both functionally and acoustic specific role.

From bottom to top:

- a "bulwark" (87 cm high) made of sound resonant wood perforated panels distanced 20 cm from the wall with 5 cm mineral wool inside. The sound absorption coefficients of perforated panels are good at all the audible frequencies and have a maximum in the midrange.

Behind the panels and through the perforations is inserted the fresh air. The large surface of the perforations (25%) allows the air to have a low speed and to be very quiet. The air comes all the same behind the treatments, from the conditioning equipment situated outside the room.

- a 60 cm mineral wool register (5 cm thick). It has a very good sound absorption at the middle and higher frequencies and is distanced 3 cm from the wall in order to increase the lower frequencies absorption. It is the height of the surround speakers and the listening position.
- 120 cm of 8 mm plywood panel membranes, inclined at specific angles to control sound reflections and to permit from the top the air exhaust and an indirect lighting of the ceiling. The “vibrant membranes” have the best absorption at the lower frequencies.

  At the front wall the “stereo” speakers have the same inclination to tilt the acoustic axis toward the listening area.

A special acoustic fabric lining unifies the aspect of the mineral wool and the plywood, also covering the entrance door. The fabric adds also some sound absorption at middle and higher frequencies.

The sound reflections coming from the wall opposite the speakers should be reduced as much as possible. That's why a large and complex wood acoustic diffuser is placed centrally, and lateral in the corners are two mineral wool oblique surfaces having the role of “bass traps” (that is, having a very high absorption at lower frequencies).

All the technologic furniture (including two standardized “racks” for mounting electronic equipment) has been specially designed and manufactured.

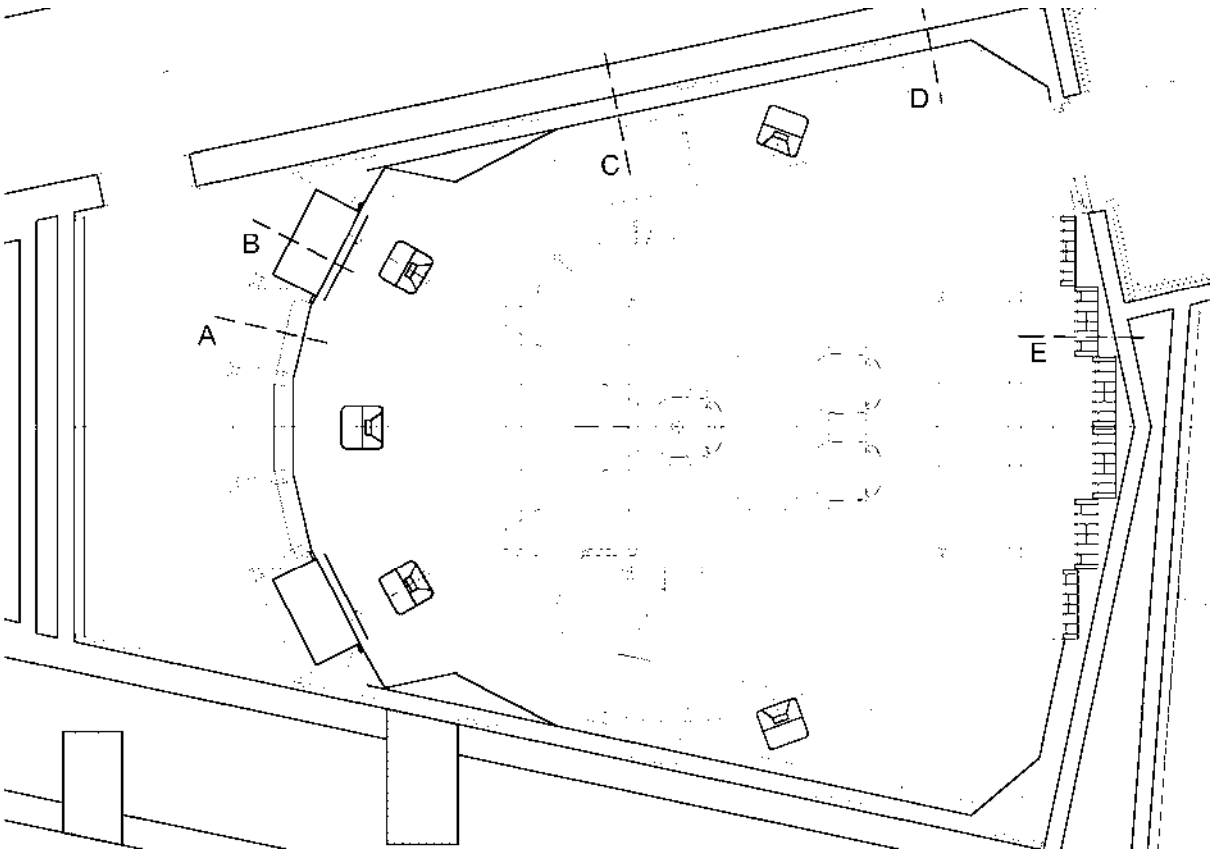


Fig. 3 Final plan of the Control Room, with all speakers and technologic furniture

As explained before the ventilation system allows the air to circulate behind the wall treatments, and being let in through the perforations of the panelling. The outlet route of the air passes from up behind the panelling and thus no ventilation openings were visible.

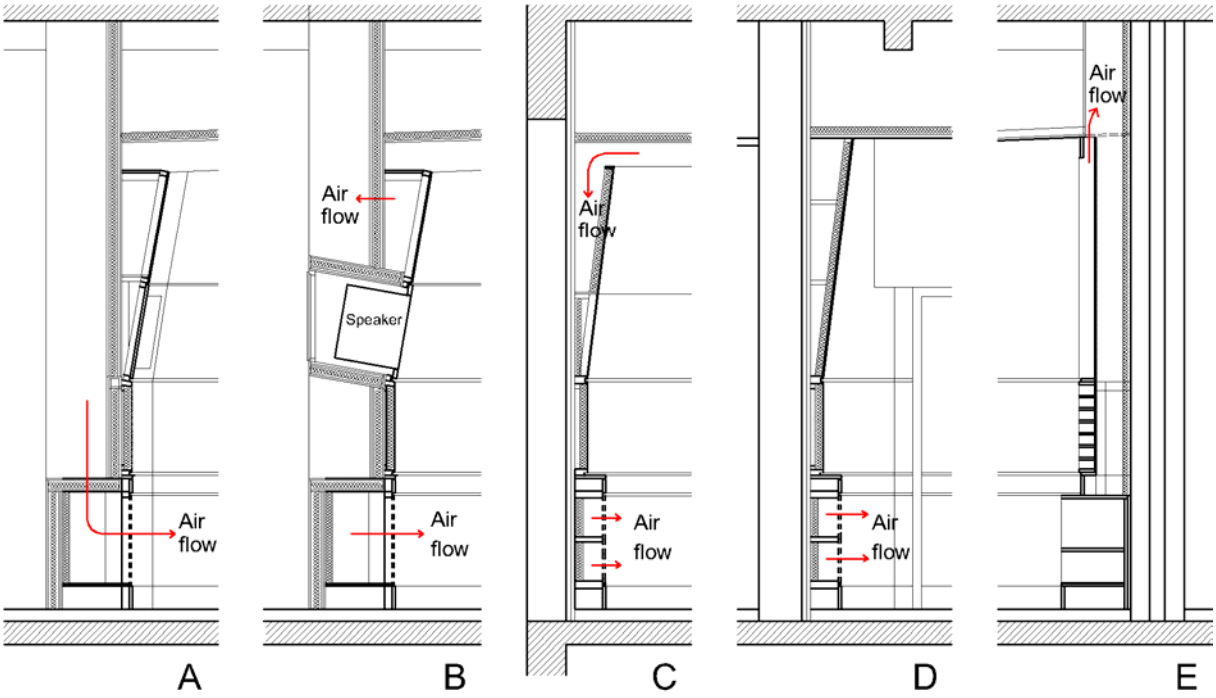


Fig. 4 Local vertical sections showing air ventilation paths

## 3 CONSTRUCTION WORKS

### 3.1 First stage

The construction works were divided into stages, in order to allow control measurements of the acoustical parameters and make necessary adjustments on the go.

The realization began with the isolating gypsum panels that doubled the masonry wall towards the corridor. The floor substructure and the complex loudspeakers wall (Fig. 5) were built in the next step.

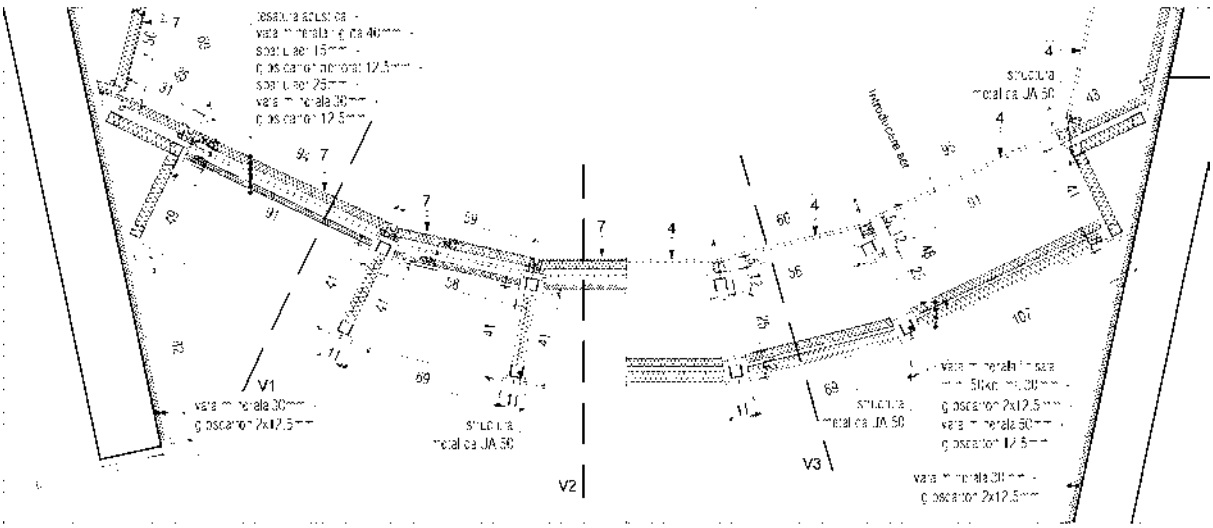


Fig. 5 Loudspeakers wall – horizontal sections at 1.0 m (left) and 0.50 m height (right)

The wall acoustic treatments were then mounted from bottom to the top: the perforated panels, the mineral wool panels, and the plywood boards.

Before mounting the fabric lining, a first control acoustic measurement was made (M1). The measurement procedure followed ISO 3382 [3] standard, using both an omnidirectional (dodecahedron) sound source and the wall mounted stereo speakers. 11 points were chosen as reception positions: 5 corresponding to the listening position (one central, two 45 cm spaced lateral positions and two more central points, one above the mixer and one 40 cm to the back), 3 positions behind the central point, corresponding to the second row of listening seats and 3 position in the back, on the second row of listening seats. For the 5 listening area positions were used all 5 source positions (only left part sources, symmetrical positions not necessary), while for the second and third row of listening seats only stereo sources are relevant.

A proof of the very high sound isolation of the control room, values for background noise were very low: expressed as Impulse to Noise Ratio (INR), measurements showed impressive >50 dB values in all points and frequencies, with >60 dB for most of the usual frequencies.

The acoustic measures were derived using the impulse response method, with an e-sweep excitation signal generated by the same software that integrated the room response, Dirac. The most important parameter is the reverberation time, $T_{30}$, but also Early Decay Time (EDT), $T_{20}$, Clarity $C_{50}$ an $C_{80}$, Sound Strength (G) were derived.

The graph of $T_{30}$ showing the average of 11 measurement positions, together with maximum and minimum values versus previously calculated ones (both final and adjusted for lack of furniture and fabric lining) revealed that the effective reverberation times for middle and high frequencies were too high compared to previously calculated ones (Fig. 6).

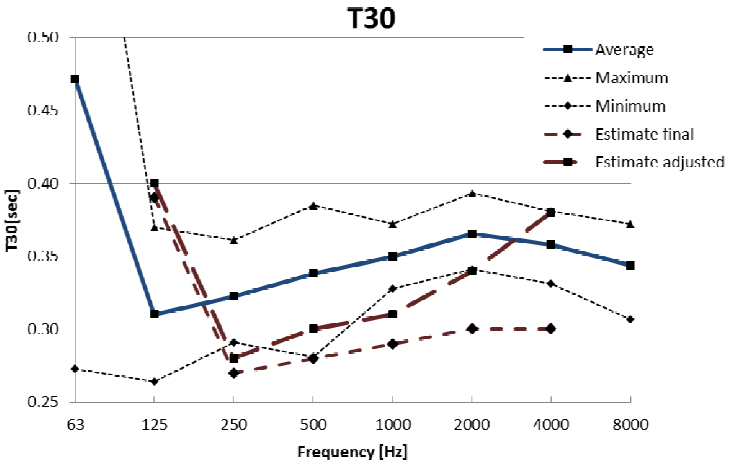


Fig. 6 Reverberation time – first measurement (average of 11 measurement points, minimum and maximum) compared with initial estimate

## 3.2 Adjustments – second stage

To compensate for that, some more absorption was needed in the 500 Hz – 3150 Hz frequency range. Removing some plywood area and thus adding more porous material would only partly correct the problem, because of the specific absorption characteristic of porous materials: very high absorption at high frequencies but only moderate-to-high at mid-frequencies. That would lead to an unbalanced reverberation curve, with lower values in the high frequencies part and higher values in the low to mid-frequencies.

The right correction consisted in realizing large circular perforations in the plywood panels, in order to expose more mineral wool and to diminish the plywood vibration (Fig.7). The perforated plywood panels with mineral wool underneath will act as coupled resonators, with

maximum absorption in the mid-frequencies, while absorption at high frequencies (above 3150 Hz) is gradually reduced compared to plain mineral wool.

Fig. 7 Large perforations made in plywood panels

A second acoustic measurement (M2) confirmed the validity of the adopted solution, with reverberation times at middle-high frequencies of about 10% lower than before.

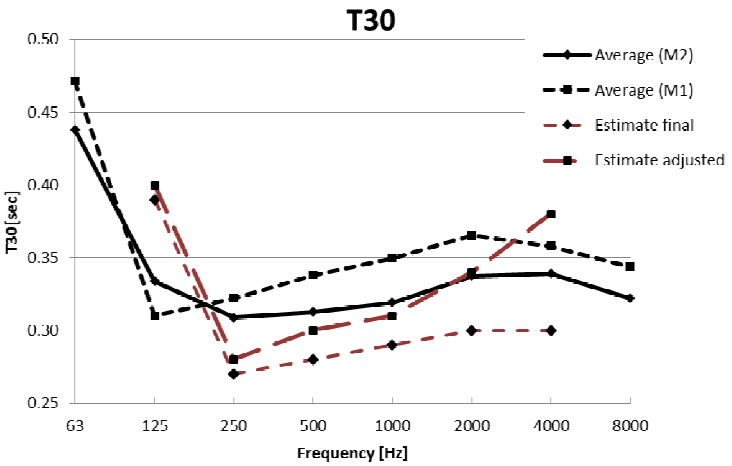


Fig. 8 Reverberation time – second measurement: average (M2) values compared with average of Measurement 1 (M1) and initial estimates

The reduction in reverberation time obtained with the perforation of the lower part of the high wall register was considered enough and no further interventions to the initial design were made.

### 3.3 Final measurement

The final stage in the reconditioning works was the covering of all wall surfaces above the first register of perforated panels in a special fabric, adding the necessary absorption at high frequencies and unifying the architectural image of the control room.

A final measurement was made to find the acoustic parameters of the completed room. There were used the same 11 microphone positions and the same sound sources as in the two previous measurements.

The results showed a remarkable uniformity of reverberation times (Fig. 9). In the entire 125 Hz - 8000 Hz frequency domain the deviation from the 0.30 sec. target is within 0.025 sec. –

less than 8.5% and half the magnitude of the accepted difference, according to EBU Tech 3276 [1]. Excluding the extreme octave bands the differences are below 0.02 sec. (less than 7%). Averaging only values for measurement points in the area of the listening position (Front) shows slightly lower reverberation times (2…8 ms) and an even better proximity to the target of 0.3 s.

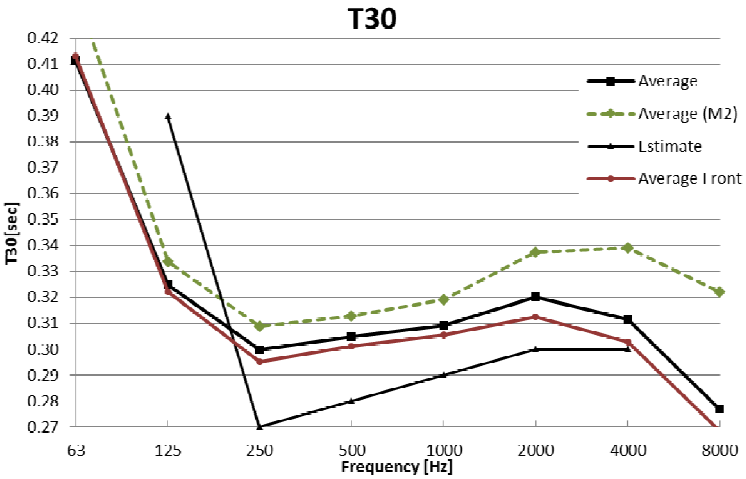


Fig. 9 Reverberation time – final measurement: average values compared with previous (M2), estimates and 5 front positions average

The analysis of the results in third octave bands (Fig. 10) shows similar results: in the 80 Hz … 8000 Hz frequency domain the deviation from the 0.3 s target is less than 0.03 s, with only one exception (125 Hz third band octave, 0.351 s). Again, averaging only values for the front of the room gives even better results.

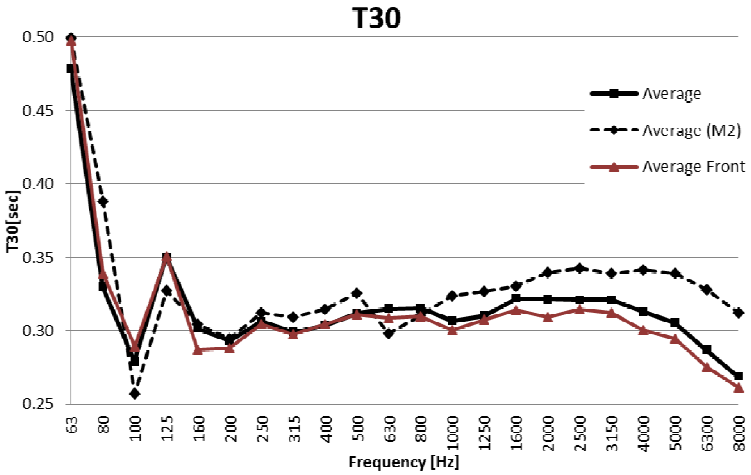


Fig. 10 Reverberation time – final measurement, third octave frequency bands

## 4 CONCLUSIONS

The renovation of Radio Romania T4S Control Room involved thorough preliminary study and complex site construction works. After a long design stage, during which crucial decisions regarding general shape and layout were taken, the construction works could begin. The initial estimation of the sound absorption proved to be a bit optimistic and some corrections on-the-go had to be made.

Partly the relative lack of absorption especially at the middle and higher frequencies is due to the fact that the mineral wool proved to be insufficiently rigid and was covered with another fabric stretched on frames.

Fig. 11 Images of the renovated T4S Control Room

Together with the very good acoustics, the innovative concealed and quiet ventilation system, the dimmable low-energy LED lighting system and the refreshed architectural image make the T4S Control Room the “crown jewel” of Radio Romania.

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# ABOVE&BEYOND- A STUDY ON ARCHITECTURE AND THE SELF

**Sabina Berariu**

*Scott Brownrigg DRU (UNITED KINGDOM)*
*Sabina.berariu@myport.ac.uk, s.berariu@scottbrownrigg.com*

## Abstract

Genuine creativity is drawing pleasure, or even aversion, from an artistic object, and being spontaneously drawn towards it, almost in spite of ourselves, as if the object itself were a medium towards some unclear *beyond*. Yet, while artistic creativity is not limited to any particular art form, such as painting, sculpting, or poems, some forms of artistic enjoy greater freedom than others. Indeed, while all artists experience freedom when they create, architects are limited by gravity in both a literal and a figurative sense- literal because their creation must not crumble, and figuratively because their final creation must internalize the world whilst externalizing the mind. In perusing this thesis, this work will begin by describing the interplay between art, artists and the freedom to create and the danger of losing this freedom. Following this broad overview, this work will narrow its focus and investigate how architecture, as a constructed mental space of order, hierarchy and memory can reflect existential space and situations of life.

One of the most interesting characteristics of human beings is creativity. This could be defined as the ability to transform the world, to imagine new possibilities, to probe the perimeters of possibilities and remake the present, to seek into the adjacent possible which a kind of 'shadow future, hovering on the present state of things, a map of all the ways the present can re-invent itself'.[1] Genuine creativity is a total state of emergence, the agony, perhaps the turmoil which the creator goes through during the stage of intellectual and design conception in his or her pursuit for creative inspiration.

M.Csikszentmihalyi believes that excellence arises in a state of flow, dictated by a coherent interaction between heart, mind and will, which work together to harness the supreme power of human potential. In the sphere of arts, this allows for the creative act to become a sparkle of intense life in contradiction with the trivial background it is projected onto. [2]

Any form of art is a result of man's imagination and creativity, therefore it is a blend of knowledge, data, intuition, passion, romance and poetry, all fused in a single note, and sung in the key of *synergy*. 'What is great in man is that he is a bridge and not an end', an entity placed on a trajectory that aims to evolution, gifted with the power to control the course of events and determine the direction of the future.

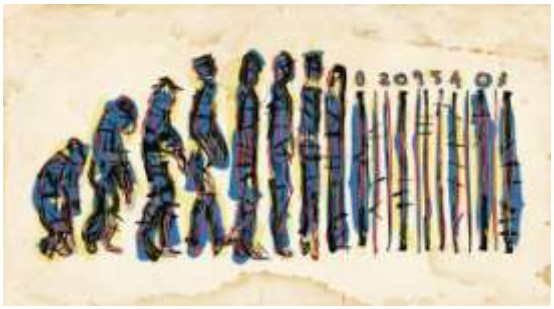
Although it may seem that future happens passively, in fact, the future is created in the present, now, by visionaries who imagine and construct it- 'There are some people who live in a dream world, and there are some who face reality- and then there are those who turn one into the other'. [3] The world is nothing more than an outline, a blank canvas for us to fill and beautify- the result of our collective memory.

The leak of information from the universal source to us, the receivers, can only happen in a state of freedom and openness. The notion of openness has been argued by Heidegger, who defines the *Open* as being the whole realm to which all beings were given over in the formation of the world. Openness can be further explained a subtle balance between knowing

and unknowing, in a state where ‘we never come to thoughts. They come to us’. [4] However, this does not imply that unknowing is ‘a form of ignorance, but a difficult of transcendence of knowledge’ which then allows the act of creation to become ‘an exercise in freedom’. [5]

The architecture of now is a new one, full of movement, a process requiring a series of aesthetic choices, each heavily informed by other factors-programmatic, social, structural and economic. Although operating within the structured frame of an objective world, architecture should aim to render intense sparkles of life and existential self-knowledge, otherwise hidden behind the triviality of a mundane existence.

It seems that under the influence of a technologically built-up world, where everything, even ‘the earth and its atmosphere become raw material’ [6] for self-assertive production, artists themselves experience a paradigm shift. This leads arts and architecture to experience ‘a loss of knowing in the subtleties of life’ [7], as they no longer grow as an adjunct to culture and human sensibility, but economics and development. Whilst being a decisive factor of progress for architectural production, the development of computerized digital technologies seems to disconnect one’s innate nature from a transcendental understanding of the world. Within a present paradigm, defined by a distorted perception of what the true nature of being is, the importance of embedding oneself in a bigger architectural discourse, in the pursuit of meaningful ideas, becomes critical.



As ‘physicians of sense’, poets inspire us to extend our search for answers and meaning through intermediation. [8] Mere retinal images of architecture might appear sterile and lifeless when compared with the powerfulness of a poet’s olfactory imagery. Just like a poet wraps his words in scents and tastes and through his work, is able to describe a whole world in all its complexity, through cross-disciplinary Re[search], architecture also can project full, comprehensive images of life able to ignite new conceptual fusions.

From the vision of a *world-craft*, architecture could be seen as the fiction of reality, harnessing the desires, knowledge and technology of its people to transform surreal dreams into reality. Through cross-disciplinary referencing, this paper aims to open-up investigation into how architecture can mediate between the world and our existential condition, and ultimately, how confidence in the future of architecture lies within weaving together the various ‘codes’ into a ‘multifaceted vision of the world’, where meaning emerges in the encounter of space and the dweller’s sense of self. [9]

**Keywords**: *Innovation, technology, cross-fertilisation, conceptual, openness, creativity, imagination, human potential, immersive sensibility, immersive culture, peripheral vision, self-programming, world-craft, self-boundaries, vastness, future, quantum physics, neuroscience, modernism, post-structuralism, psychology, visual aesthetics, self- awareness.*

# 0 AN OVERVIEW OF STRATEGIES, RESEARCH METHODS AND ELABORATION OF ARGUMENTS

*When everything is connected to everything in a distributed network, everything happens at once*.

-Kevin Kelly, *Out of Control*

*Without metaphysics, not only is there no philosophy, but no art.*

-Schenk

*Meaning is a contest between past history, the current system and future change.*

- Richard Bolton, *Calling All Codes*

Through cross-disciplinary research, this thesis aims to identify artistic, philosophical and scientific positions which have nurtured the development of an aesthetic theory of immersive consciousness within various disciplines and crossing different historical periods. These positions and strategies will provide my thesis with substantial theoretical and historical data in order to form a coherent theory of immersive sensibility towards architecture, as a constructed mental space of order, hierarchy and memory, where meaning emerges in the encounter of space and the dweller's sense of self.

Most notably, the thesis conducts a philosophical interplay between theoretical positions which address aspects of phenomenology and idealism, with an aim to open up a territory of signification and possibility for the creation of hybrid and de-territorialised methods of perceiving and practicing architecture and architectural theory. Hence, its strategic goal is less focused upon providing the reader with a sealed research artefact, and more upon inviting one to purge conventional ways of thinking and engage in an experiential process of self-discovery, where individual conceptual fusions emerge.

This paper is divided into two sections. Both sections have a holistic approach towards a variety of theoretical notions and evidence, with a vision to encourage strategies of immersive discovery in the pursuit of innovative directions in art and architecture. However, each section has its particular emphasis and research methods. In terms of methodology, Section 1 is a blend of both theoretical and practical evidence with reference to various disciplines, which I found relevant to the investigation of immersion-ability into the architectural discourse. Section 2 reconciles the research methods and style found in Section A with a focus on debating and adding to the theoretical foundation from Section A, bearing the structured frame of an objective world, heavily informed by programmatic, social and economic factors.

The philosophy behind structuring the thesis in such manner stems from the discoveries of quantum physics, which teaches us about the conflation of polarities. Hence, the subjective realm-reconciled by the relativist style of Section 1 and the objective realm-reconciled by the more absolutist style of Section B are intricately linked. This methodology might support, then, the underlying rhetorical strategy of my research thesis, formulated as a fundamental response to the rigidities of a technologically built-up world.

The emergence of such dynamic, abstract thoughts, together with applications of previous philosophical studies- all these will be articulated in an open, immersive discussion which is both non-prescriptive and intellectually responsible.

# 1 PHILOSOPHICAL FRAMEWORK MATERIAL

## 1.1 The human subject

*What is great in man is that he is a bridge and not an end.*

-Friedrich Nietzsche

### *1.1.1 : Immersion*

In perusing this thesis, we can ascertain that understanding the kaleidoscope-like encoding of the world requires an immersive sensibility of the human subject. Aesthetic immersion, by definition, is non-linear, non-logo centric and non-hierarchical, and it liberates us from the boundaries of our ordinary human cognition.

### *1.1.2 Self-programming*

Awakening happens through an operation of self-re-programming, which occurs in a transcendental space between the human subject and the immersive art. With reference to literature, Wolfgang Iser explains the encounter with a written text as a transaction situated somewhere between the text and the reader, in a third realm of interaction. [10] However, the self-programming adjustments one makes in the process of understanding the complexities of art work are not omni-directional, and the sensorial closure is never fully induced. Similarly, Bell Hooks defines the notion of learning as an endless exchange of ideas, leading to a liberating "kind of ecstasy" within the receptive subject. [11]

### *1.1.3 Consciousness*

*Consciousness in the function of self-reflexivity should be operating within the elements of the work of art itself.*

- Joseph Kosuth, *Within the Context: Modernism and Critical Practice*

*There is nothing that we know more intimately than conscious experience, but there is nothing harder to define.*

-Chalmers

Fundamentals of psychology and neuroscience break consciousness into two key components: the subjective state of awareness and the objective aspect of neurological activity. Chalmers established that cognitive neuroscience did not elucidate how subjective experience stems from an organic assemblage of 13 billion neurons. Hence, for Chalmers, consciousness is "the phenomena of experience" and "there is a direct correspondence between consciousness and awareness". [12] Dr. John Lilly defined consciousness as the human "self-metaprogrammer". [13] In agreement with Immanuel Kant (1724-1804), Schelling stated in 1988 that the only thing which we have direct, unquestionable knowledge of is our consciousness. [14] Through cross-linking various definitions of consciousness, we can establish that consciousness is an intricate totality, the awareness and the subjective experience recorded beyond corporeal neurological processes.

### *1.1.4 Knowing and non-knowing*

The word *consciousness,* similarly to *science,* has its roots in the Latin verb *scire*- which means to know. However, unlike science, consciousness in art is, inherently, a much more complex process. Knowing is accompanied by an equal capacity to forget knowing, a state where "we never come to thoughts. They come to us."[15] However, this does not imply that unknowing is "a form of ignorance, but a difficult transcendence of knowledge", which then allows the act of creation to become an "exercise in freedom". [16] With reference to

painting-as a visual art which bears witness to a skill, the paradigmatic conception and reception of art take place independently of it. This can be exemplified through Jean Lescure's comment on a study of a painting by Charles Lapicque: "Although his work gives evidence of wide culture and knowledge of all the dynamic expressions of space, they are not applied; they are not made into recipes." [17]

#### *1.1.5 Purpose*

In accord with this, art should be an increase of life, a suite of surprises able to stimulate our consciousness and prevent it from becoming somnolent, turning us into "vicious automata of self-will". [18] "An artist does not create the way he lives; he lives the way he creates". [19]

Early in the 20th century Marcel Proust (1871-1922), in his masterpiece *Remembrance of Things Past*, calls upon the understanding of atmospheric impressions beyond the aesthetic- with reference to Elistir's painting, Proust exemplifies the interactive process of re-programming the art through the self and the self through art, writing that the roses were a "new variety with which this painter, like some clever horticulturist, had enriched the Rose family". [20]

### 1.2 The absolute

#### *1.2.1 Absolute as 'Openness' in Heidegger*

*Let a flowers' being be great to us.*

-Rayner Maria Rilke, *Späte Gedichte*

Martin Heidegger defines the *Open* as being the whole realm to which all beings were given over in the formation of the world. In accord with this, R.M.Rilke refers to the beings that belong within the great whole of the *Open* as the "great-accustomed things". [21]

#### *1.2.2 Absolute as 'Vastness' in Baudelaire*

In *Poetics of Space*, Gaston Bachelard debates the notion of vastness. Indeed, one of the most Baudelairian words, *vast* is used here to describe powers of unity able to liberate us from the chains of our anguished existence. For Baudelaire, man himself is "a vast being", able to institute "Correspondances" between the two kinds of grandeur, the immensity of the world and the immensity of his inner being. [22]

In his *Journaux intimes*, Baudelaire writes: "In certain almost supernatural inner states, the depth of life is entirely revealed in the spectacle, however ordinary, that we have before our eyes, and which becomes the symbol of it." Within vastness we are no longer limited by the walls of our chimerical prison but instead we are taught how to inhale infinity in our lungs and how to "breathe cosmically an air that rests on the horizon". [23]

Baudelaire adds that limitlessness in creation can be attained once we realize that we need to free ourselves from the imprisonment of our own negative self, for we cannot change the place before changing our nature: "Neither in the desert not on the bottom of the sea does one's spirit remain sealed and indivisible."[24] Each time we connect to a higher entity, we facilitate "transactions between two kinds of grandeur" [25], thus allowing us to communicate with a psychically innovative realm and withdraw creative energy from it.

"And with a stroke of the pen I name myself/ Master of the World/ Unlimited Man." [26]

#### *1.2.3 Freedom as 'Repose' in Bachelard*

In accord with Tristan Tzara, Bachelard understands freedom as a trustful surrender "in the palm of repose". [27] Repose is defined as an ecstatic moment of self-abandon and inner

immersion, where the contours of the exterior world are no longer bounding, as they progressively become internalized: "When the level rises outside, it also rises in you, it grows in the capillary veins, drawn upward into the furthermost branches of your infinitely ramified existence. It overflows from you, higher than your respiration". [28]

Jorn Utzon exemplifies the power of self-abandon through his conceptual sketches for Bagsvaerd Church, which depicted the transformation of a group of people on a beach into a congregation in a church with cloud-like vaults. (Fig.1) Watching the formations of clouds hovering in the sky while lying on the beach in Hawaii inspired his design for poetic, cloud-like undulating ceilings and sky-lit corridors.

Fig. 1 Jorn Utzon. Conceptual sketches for Bagsvaerd Church

### *1.2.4 Surrender as 'Uncertainty' in Heisenberg and Herzog*

With reference to quantic mechanics, surrender could be associated with uncertainty. The notion of uncertainty was originally demonstrated through Heisenberg's principle which proved a fundamental limitation to the precision which physical properties of a variable can be measured with. Scientific research demonstrated that the more precisely the position of some particle is determined, the less precisely its momentum can be known, due to an infinite dispersion of energy.

In accord with Heisenberg, Herzog argues that the access to "ecstatic truth", as opposed to scientific truth, is attained through entering a sort of state of "vulnerability" [29], where reaching depth, according to René Daumal, occurs through sensing and feeling-*éprouver*, rather than through scientifically proven truth-*prouver*. [30]

## 2 THE OBJECTIVE REALM

### *2.1.1 Science, Technology and Art*

My encounter with academia and practice to date has sparked an interest in understanding the relationship between art and technology and the correspondence between the objective nature of technological progress and the subjective, anti-utilitarian nature of art. In this regard, I am in accord with the post-structuralist movement, which encourages interdisciplinary cross-fertilisation as the only means for responding to the complexities of the human subject.

Humphry Osmond and Bernard Aaronson defined technology as "the entire set of devices, whether mechanical, chemical, or linguistic, by which adaptations of individuals to their environments are enhanced". [31]

On the other hand, Herbert Marcuse (1898-1979) argued that, although it operates within the objective frame, the purpose of art is to encrypt ideals to which people can relate with their own creativity and visionary thoughts. [32] Following the shift from industrial to service to information technology, we must inquire into the effect of science and technology on the

idealistic imagination and creativity of the artists. In accord with this, Frank Popper highlights the importance of understanding the distinction between science and technology- whereas science is the rational knowledge of physical phenomena and its effect on art can be assessed purely in theoretical terms, technology is the application of science at industrial level and originally on the pre-industrial level of arts and crafts. [33] Hence, technology procedures have a practical impact on art and they may be adopted as part of an overall process of transmutation, providing assistance into realising introspective artistic techniques.

### *2.1.2 Art and Visual Aesthetics*

*The evolution of art is something internal, something philosophical and is not a visual phenomenon.*

– Lucio Fontana

Applying basic science, philosopher Thomas Metzinger says, "In the physical outside world there are only electro-magnetic oscillations of certain wavelengths", thus "all we find are myriads of subtle electrical impulses." [34] Hence, analysing the relation between the outer tangible world and the human cognitive inwards, we can argue that thought, self and experiential immersion are non-localised, non-hierarchical, yet unified frequencies, which allow immersive consciousness and creativity to arise through immersive awareness.

The perception and understanding of architecture is a multi-sensorial experience- the spirit of the place, its proportions, colours, textures, sounds, smells, are all recorded equally by our senses. Human perception does not have a hierarchical structure based on mere vision, as the eye collaborates with the body and the other senses: "I lend my emotions to the space and the space lends me its aura, which entices my perceptions and thoughts". [35]

Rural Studio was established by Samuel Mockbee and D.K. Ruth in 1993, with a vision to simultaneously demystify modern architecture and expose students to extreme poverty in their own backyard. Their philosophy is that poetry through architecture can only be made "by letting a building evolve out of the culture and place", and that "as a social art, architecture must be made where it is and out of what exists there".[36] With an intention to formulate sustainable, yet meaningful responses to local issues, Rural Studio has an experimental and innovative approach, drawing inspiration from "anything that has a quirkiness to it, a mystery to it", trying to incorporate the best from the old, "shacks and barns, tornado shelters, chicken coops, warehouses, burned-out houses where all that's left is the chimney" into "materials that reinterpret contemporary aesthetics". [37]

Jan Gehl refers to the interchange between the outer penetrable world and the inner dimension in his book *Cities for People*. His notion of a feedback loop where "we shape cities, and they shape us", [38] suggests that the outer world is the projection of our immersive consciousness, the "result of a few qualities working in concert". [39] Hence, they should occur as a result of active interactions between conceptual metaphysics and physical constraints.

### *2.1.3 The promise of poetry*

Alongside, Bachelard believes that poetry illustrates the inner delight of sharing emotions with the immediate surrounding context, where "we experience an extension of our inner space even in the presence of a perfectly familiar object" [40]. Purely retinal images of architecture might appear sterile when compared with the powerfulness of a poet's olfactory imagery. Just like a poet wraps his words in scents and tastes and, through his work, is able to capture the world in all its complexity, architecture can also project full, comprehensive images of life able to ignite new conceptual fusions. Poetry inspires us to extend our search for answers and meaning through immersion in a larger array of experiential processes.

*Space, outside ourselves, invades and ravishes things,*

*If you want to achieve the existence of a tree,*

*Invest it with inner space, this space*

*That has its being in you.*

-Rilke, 1924 *cited in Bachelard, 1994, p.200*

*2.1.4 Architects as limited by gravity- literarily and figuratively*

*The creation continues incessantly through the media of man.*

-Antonio Gaudi

Though architects, like all artists, are free to be genuinely creative, their freedom is, nevertheless, more limited. An architect, for example, cannot do what Escher was able to do. (Fig. 2)

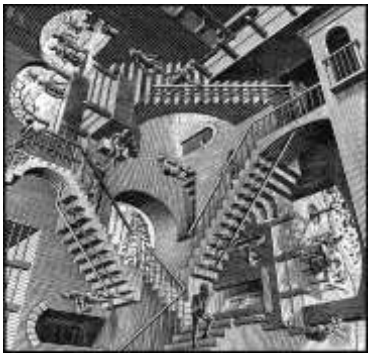


Fig. 2 Escher Relativity Lithograph, 1953

And though it is true that they can, of course, rebel and generate buildings that seem to defy the laws of gravity by exceeding height and proportion, they are still bound by the weight of the context that surrounds them. In other words, architects do not have the luxury of an empty space in a museum and the relative privacy of an exhibit. But, though their works are predestined to be weighed down by their surroundings, they can still turn this limitation to their advantage by drawing from a place's spirit.

*2.1.5 'ARTchitecture'*

*The highest art will be the one that presents in its contents of consciousness the thousand-fold problems of the time; to which one may note that this art allows itself to be tossed by the explosions of last week, that it pieces together its parts again and again while being shoved by the day before.*

-Tristan Tzara

Chalmers states that attempts to confine the meaning of consciousness and artistic immersion have proved impossible. [41] The concept of immersive transitions exists, in more perceptible terms, to which architects are required to respond to in terms of urban planning strategies and residential developments. However, the notion of immersion in architecture, as an abstract, subjective experience, is equally non-reductive. As with art, the purpose of architecture is to envision correspondences between the physical world and the conceptual metaphysics.

Rebecca Kaplan argues that "architecture could be considered as the most immersive of the arts, but firstly, it must qualify as art". [42] Artistic grandeur has been achieved from small scale architectural projects to large urban developments. Pertinent, illustrative examples of

elegance and idealism achieved through artistic unity and totality are Antonio Gaudi's masterpieces in Barcelona (Fig.3) or the renaissance Italy's Città Ideale. (Fig.4)

Fig.3 Park Güell (Gaudi, 1900-1914)

Fig.4 La Città Ideale

## 3 VALIDATION OF HYPOTHESIS

*Why an immersive sensibility?*

*To be an artist is not a matter of making paintings or objects at all. What we are really dealing with is our state of consciousness and the shape of our perceptions.*

-Robert Irwin

Having identified relevant examples of immersive culture through dialogical cross-examination, conducted within different social, cultural and historical contexts, the study aims to turn towards answering the question which led to the inception of this research in the first place- the *why* behind formulating and implementing a theory of viewing from within.

As the process of immersion requires entering a state of detached, non-graspable, continuous self-mirroring, it becomes a meta-symbol for fulfilling human aspirations and potential. Thus, not only does it address art's primordial function of weaving together the abstract, overwhelming phenomenon described by Hegel and Nietzsche as the *absolute*, but it also interrogates self-expansion when the theory of immersive sensibility is incorporated into our everyday view of the world. Schelling believes that through art, the mind is able to come to a full awareness of itself. Hence, in accord with this, I conclude that in the process of artistic immersion, we intrinsically model anti-hierarchical models of ourselves which then allow us to re-program the act of creation and, ultimately, the world around us.

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# THE EXPERIMENT AS NECESSITY WITHIN THE COMPUTATIONAL DESIGN PARADIGM

**Ina Leonte** [1]

[1]*Faculty of Architecture, Ion Mincu University of Architecture and Urbanism Bucharest, ROMANIA*
*leontecm@gmail.com*

## Abstract

Within the computational design paradigm there has been extensive theoretical advancement, which has not yet manifested its estimated potential in the built environment. We, computational design adopters are always happy to see a new pavilion, intelligent façade system or new 3D printers but that seems to be all we have to show for the shift between designing form and designing formation. Design as open process generates the necessity for negotiation between letting go of control versus having the last say in the matter of form. The shapes that open-ended design creates hardly ever manifest like architecture as we know if they remain faithful to the morphogenetic algorithm. However, computational design has produced many intelligent small and medium scaled projects that reside at the boundary between architecture, experiment and art. These installations play an important part in mapping the unknown territory created within the new technological framework through novel design methods.

Design as open process has been interpreted with regard to morphogenesis. However, it may well be interpreted as an open-system with regard to participation, namely its relationship with the community. With open-source construction platforms such as WikiHouse [1], we notice that the changes the new paradigm is bringing forth are not necessarily changes in form, but changes in platform. The theory behind computational design is building a new world image where flows and processes are positive concepts and have become part of the design theme. The new tools and technologies may have surpassed our ability to understand their potential.

These definitions have yet to take shape in our context, where computational design is apparently failing to show outstanding benefits that go beyond technical performance. This paper discusses the importance of experimenting within this new framework, wildly and even childishly so. Experiments have an outstanding importance in our field nowadays, as they embody the non-linear nature of the theory behind computational design. They are designed to uncover the potential of the emergent design methods that make use of digital fabrication. The joy with which Rhino Grasshopper users create complex shapes with little use or significance has endured some criticism when in fact it is the only way to step out of our traditional ways and discover computational-specific approaches to design.

Therefore, experiments are essential for as long as their result is not cast as the super-project that is changing the world and they are treated as such. They have become a fundamental means of investigation in discovering what is valuable and what is merely instrumentalism in the use of new design methods and digital fabrication. Within this framework, the paper presents the evolution of the WAVICS 3.0 interactive installation created by myself, Andrei Mitisor, Aostacioae Mihai and Deaconu Irina. This is an experiment concerning interactive surfaces and the part they could play as components of built space. It is an interactive surface made of 615 square mirrors that act as moving pixels. The mirrors react to the presence of the user by moving towards their right hand and following it around. The paper presents the

unpredictable changes that took place between concept and materialisation through different phases of the design and, more importantly, how WAVICS 3.0 was validated as an experiment through use and not by our initial predictions.

**Keywords**: computational design, digital manufacturing, experiment, architecture, process, interaction, mass-customization

# 1 THE EXPERIMENT AS NECESSITY WITHIN THE COMPUTATIONAL DESIGN PARADIGM

## 1.1 Introduction

Within the computational design paradigm there has been extensive theoretical advancement, which has not yet manifested its estimated potential in the built environment. We, computational design adopters are always happy to see a new pavilion, intelligent façade system or new 3D printers but that seems to be all we have to show for the shift between designing form and designing formation. Design as open process generates the necessity for negotiation between letting go of control versus having the last say in the matter of form. The shapes that open-ended design creates hardly ever manifest like architecture as we know if they remain faithful to the morphogenetic algorithm. However, computational design has produced many intelligent small and medium scaled projects that reside at the boundary between architecture, experiment and art. These installations play an important part in mapping the unknown territory created within the new technological framework through novel design methods.

During my mobility at The Institute of Advanced Architecture Catalunya I witnessed several presentations from the students taking the Digital Tectonics master. At the time their work was challenging in terms of perceiving its immediate usefulness to the architectural field. The students' task was to create a way to manipulate a certain material they had picked in the beginning of the term and create structures that are specific to the behavior of that material. The choices were made between plastic, magnets, straws, sand, clay etc. One of the works that was exhibited there is Inder Shergill, Ana Kulik and Peter Novikov's creation: The Stone Spray Robot. What they did is to replicate the way we build sandcastles by dripping water and sand and creating an informed mound of sand sprays. They articulated a robotic arm which would mix sand and a very strong adhesive that would make their structures very stable and resistant. Their mission was to make use of resources that exist in large quantities and use them as building materials in places like the desert where there is an abundance of sand. All the similar projects were oriented toward a very specific goal and did not set out to fix world problems, which at the time seemed a very awkward choice for architect-type individuals.

The team's experiment did not yet bring world peace or end the housing crisis but it did play a part just by being an experiment. The students have documented their findings and communicated them at international conferences, through articles and their blog [2].

In a world where our capacity to describe reality according to this new model [complexity] far exceeds our capacity to explain it (Kwinter, 1993: 213) experiments are like a blind man's cane to the path ahead. As my thesis coordinator, prof. dr. arch. Augustin Ioan, would say, the fact that these technologies and techniques have come to exist is reason enough for us to research their potential. He would always answer like this when prompted to explain why we should change the way we do things now or why these new findings are important.

## 1.2 Designing with complexity breeds contrast within the architectural practice

In an economy where predictions are bordering science fiction by relaying the possibility of shifting to a renewable resources scheme in a potentially open democracy, architecture is prompted to create compatible utopian scenarios. These scenarios don't have the character of a well-defined target but more a cloud of expectations from ourselves and from our environments. And it is these expectations that we have been addressing through computational design for a couple of decades now. It is within this context that architecture institutes such as IaaC are designing masters that deal with the experimentation of new design and fabrication methods. For phenomenologists such as Alberto Perez-Gomez, the introduction of the computer in the architectural practice has helped reduce architectural discourse to issues of instrumentality (Perez-Gomez, 2008:199) whereas before, the ongoing debate was trying to deliberate on whether architecture belongs to the fine arts or it behaves more like an applied science, according to Perez-Gomez. Nowadays, the most popular

discussions presume the importance of this so-called paradigm shift and focus on the potential and limitations of this instrument, aiding the perpetuation of the dichotomy, says Perez-Gomez.

The dichotomy is also fuelled by the differences that arise between the experienced architect endowed with a better understanding of the world and the computer-geek architect who can bend programming into any shape he can think of. As per all the contrasts above, the contemporary attitude is one of inclusion, where architecture can be both a fine art and an applied science, computational design is both necessary and misunderstood, and experienced architects belong with computer savvy youngsters. The latter two archetypes are promising to be resilient in their behaviour as the technological gap is not promising to be bridged in the near future. The technological gap between older generations and the newly graduated is a given and computational design can create a context where the abilities of both are connected in order to achieve performance meaningfully. This can be achieved as long as experienced architects are updating on theory and students are basing their technical skills on less utopian scenarios then what they are being taught nowadays [3]. You can't rely on what you knew five years ago, is what Patrik Schumacher believes about the technical skills involved in creating contemporary architecture. At a certain point this means that when you move up in practice you lose that ability of constantly upgrading while working in bigger teams for bigger projects. But you always rely on the latest generation of architects. This is interesting for young architects, it creates a new dynamic. (Leonte, 2014: 148)

Technology's speedy pace makes the constant upgrading of technical abilities difficult to achieve. While the older generations are always behind on the technique, the young generations are behind on understanding the intentionality and meaning of the design feat. Co-operation, as excruciating as it may sound, becomes an even more stringent demand and needs to become operational.

One such successful team at work is the poetic and world famous architect Thomas Heatherwick and Sawapan, a computer programming team with a background in architecture and engineering. While Heatherwick is a highly conceptual architect, Sawapan's Panagiotis Michalatos and Sawako Kaijima are in the business of translating that into fabrication with intuitive interfaces that translate design decisions into producible projects. These interfaces are project-dedicated as was the one created for the UK Pavilion in Shanghai [4]. They are the unique Autocads of each design. Within this context, it is plain to see that our attitude toward architecture will become more open, more cooperative, and more technological and, paradoxically, less instrumental. The complexity of design translates into a more dynamic workteams that fosters both the human nature of the design process and the technical requirements to apply it to our contemporary environments.

## 1.3 Experiments don't look smart

We are practicing architecture inside this transition, where it seems that one must pick a side in order to move forward. Working with our clients, we have noticed one general view of the design act, from their perspective. The end users are not irrelevant to the evolution of our profession and they are currently relaying a general message: they always want a mix between something traditional and something modern. At first vexing, this attitude actually expresses the pace of mainstream approval for the innovations in the domain.

However, that is why leaps are not taken by the mainstream in upgrading the design methods but by those who rely on innovation and creativity. There are not many architectural programs that are launching into applying the newest ideas and technologies to their large scale projects. However, there are still some areas where adhering to novelty is either a requirement or a cultural necessity. In this capacity, fashion and fast cars [5] are an architect's best friend. Otherwise, we must rely on buildings with cultural activities to commission high priced experiments with a superior representational power. Any such project also involves high maintenance costs, as it is not optimized to fit in our current systems that perform well because they are standardized (ventilation, cleaning, heating etc.). Imagine what it takes to clean Frank Gehry's Bilbao Museum facades, or any of the latest Coop Himmelblau creations.

Therefore, implementing new technologies on a large scale involves great costs and risks. The projects that do get built become research material. For architects, they are the oversized guinea pigs of the built environment. This testing period is the one we are going through now globally but less so in Romania.

Many "paper architects" at the dusk of the twentieth century were promoting these surreal projects that seemed to follow Antonio Sant'Elia more than Le Corbusier in terms of implementation. Some of those who drew utopian worlds and were questioned for their lack of pragmatism are now starchitects of our time: Daniel Libeskind, Zaha Hadid, Bernard Tschumi and others. They are putting to work their previous research on new means of representation and design thinking and they are active builders. (Klinger, Vermillon, 2006: 79) The ambivalence of the reactions to their searches is inherent. Visionaries are right to elude the image of the considerate builder. Not all their visions are part of our future but the fact that some of them could be is reason enough to support their searches.

At a smaller but not less significant scale every pavilion or installation built by students participating in computational design workshops anywhere in the world is part of this test as well. Most workshops are documented on-line and easily become references for future similar projects. It is common for out of the ordinary and initially unpractical ideas to make their way into the architectural practice routine when the time becomes right. How else would the domain remain sensitive to their dynamic physical and cultural environment? However, not all the ideas, concepts or experiments that are being thought of right now will get to populate our surroundings. Those which will make it take with them the lessons from those which will be forgotten. The versatility of digital manufacturing and computational design starts to address the realities of building. Looking at workshop results from 5 years ago and what is being done now, it is obvious that the field is advancing at least in fixing the problems that had risen in the past experiments. The increase in numbers of these workshops as well is mapping the interest for such design knowledge. The pavilion as program is extremely useful to our domain in these times. It is a basic level architecture where the only function is temporary sheltering, therefore its shape is dynamic, context sensitive and matter friendly. The loose definition of the parametric pavilion program is characteristic to today's theoretical and technological developments which are open in nature. It is an open program which is defining itself through experiment.

An even more open program for experimenting is the so called installation, a general concept fostering any and all endeavours that have no functional identity. In architecture, an experimental installation can research material behaviour, fabrication techniques, user interaction etc. The following segment of this paper is a journal for such an experiment, from concept to exhibition. It is a statement for what learning through experiment meant for a team of young architects and a plea for more freedom, initiative and openness in our field toward playful experimentation.

## 1.4 Wavics 3.0 – A case study

Aditiv, a young team of alternative media designers which I am part of got to present a interactive installation and their first project at the FAB10 International Conference in Barcelona in 2014. Wavics 3.0 is a project started out of curiosity and completed through much conceptual thinking and more handy-work. As part of the Parametrica Workshop Results exhibition we went to Fab10 [6] to put to use an interactive installation called Wavics 3.0.

Having been interested in digital fabrication for a few years we thought we knew what the event was going to be like. We did not. Together with Andrei Mitișor, Tudor Aostacioae and Irina Deaconu, we set out to build a wall of mirrors that reacts to body movements to show what technologies can be put to use for creatively. The concept goes back to the first time we realised the attraction we have for interactive surfaces and Andrei's ability to build a CNC milling machine from scratch. When we were offered the opportunity and the financing to take it to the Fab10 we shifted into fast gear and started testing what we envisioned to be a real-time transforming wall of mirrors that communicates that people have the ability to participate in the transformation of our environment[7]. Hopefully, through a bit of debate, we were going to explain to the users that this ability comes with a responsibility. This far in time their only responsibility is to learn that alternatives to architectural spaces as we know them exist and to express the way they relate to such an idea while being entertained by the novelty of an interactive surface under their control.

What we ended up with instead was an incredibly complex project that would have probably required 10 times the amount of time we put into it to become a stand-alone interactive surface that is intuitively perceived as what it is and is instantly used as we had envisioned it. Thankfully, we did not have the time and we got to continue work on it all through the Fab10 event, with the help of many people there. The state of vulnerability we found ourselves in was a catalyst for connecting to the community there at a rapid pace. The Fab10 is an incredible hub of knowledgeable people, with vague job names and great expertise with new software (Rhino Grasshopper, Firefly, Processing etc.) and technologies (CNC, laser cutters, 3d Printers, Kinect etc.), all of which were part of Wavics somehow.

Sohill Patel, a programmer from India, was drawn to our project and started working on the processing code almost instantly. In a matter of minutes, him and his friends had pretty much pushed Andrei aside from his computer and started a brainstorming of their own over our grasshopper definition. Then Sohill started work on the processing code as an alternative and cleverly pointed out that in order for the people to understand what they had to do more intuitively we should show them how the Kinect sees them. Which we did, and which instantly eased the process of learning how to make use of our wall of mirrors.

This is how our installation started working at better speed with greater deformations and more autonomy and how many plans of future optimization were concocted. The reactions of people, even with its current slow response were unbelievable. They went from being confused to being surprised and amazed in a matter of

seconds. Those who were patient enough went on to see how the wall reacts to each of their moves said things like This is amazing, I want to put my face in it! Or Wow, this is genius, keep up the good work!

Through our engineer goggles we failed to understand how this prototype was being perceived as wondrous when in fact we were only counting glitches. After disconnecting from the event we understood that this kind of experiment is appealing to a need to belong to a contemporary community and to communicate.

Wavics is a crowd attractor and it is a catalyser of conversation by triggering feelings of surprise and using little knowledge in order to be experienced. The minute we turned it on people gathered, they listened to the instructions carefully, stood in line and started waving their hand at it to see what happens. When none of us were there to explain, they would start telling each other what to do. The most amazing thing we experienced is people explaining the whole mechanism to one another. This is why our definition of success has totally shifted from – let's make something perfect to – let's see what this can stir in the people who use it. At least as far as Wavics 3.0 goes. The rest is yet to come.

At some point in our fights with Firefly Katie came. Katie swiftly gave a face to the word expert in our dictionaries. She rewrote Firefly components so they wouldn't crash so much. She was like a warm hand, not complaining about all the issues, just trying to understand them better and optimize everything in a way that it can best use the resources as well as serve our purposes. Now that is not something you get to witness everyday. These are the people of Fab10 and this is the face of the computational design community. They learn through forums and have a problem-solving mentality.

Unexpectedly, it is this shaky outcome that actually proved to be the most useful for our growth. The glitches we kept facing were in fact the incredibly honest reflection of all the assumptions that we had made: the project in not that complicated, I'm sure I can make this work with Firefly, there is no lateral force pushing on the mirror sticks, it can't take more than a week to build the mirror mesh, the wall will interact to the human face, the mirrors will be coplanar when they retract etc.

As we realized the project is way bigger than we had expected, solutions kept popping out to put all problems to shame. Is that all you've got? was the general feeling throughout the production process. The first big breakthrough we got was to be allowed to virtually live in the Kaustik production halls, where we had at our disposal huge CNC milling machines, laser cutter, drills of all shapes and sizes, dozens of glue bottles, screws and a warehouse full of materials. Yes, Paradise is hidden somewhere on Popa Nan street in Bucharest. The sawdust in our lungs and eyes did nothing to prevent us from basking in the production freedom this gave us and without which we will not have been able to ship our project to Barcelona.

Wavics started from what we thought was a concept and materialized through a set of fortunate conditions, ambitions and coincidences that gave it the strength it has now. It is the strength of the unfinished project that connects to everything in order to reach the next stage. The real-time transformation of the environment by its inhabitants is a very interesting concept, with roots in the architectural theories of participation dating for more than half a century. However, putting this to work with no engineering, electronics or programming skills showed us the very raw interval that concepts have to cross between their ideation and their materialization in a way that architecture hasn't so far. Having to deal with a project unlike anything we have put together before is actually an experience where any premise is open to questioning just like every other decision. It is a Jenga of choices that paradoxically keeps falling as well as getting stronger by means of constant testing. This is the marvelous quality of experiments – they bring the experimenter to the core of any and all information they ever got, therefore forcing him to step out of any known pattern that may artificially guide their imaginative thinking.

The Fab10 atmosphere is the real-life experience of what books say about the value of working with interdisciplinary teams and the incredible importance of communication. The Fab10 was an education driven environment and not so much a design exhibition. It revolved along how and not what. Wavics was, therefore, an oddity in the midst of an event comprising of numerous workshops about digital fabrication and Arduino, talks about how new technologies promote customisation instead of mass-production. The pervasiveness of these technologies have been represented in the Fab10 by W. Afate 3D Printer, made out of e-waste in Togo by a resourceful geographer turned engineer. He wanted to build a printer but didn't have a basic toolkit so he recycled whatever was handy and invented the cheapest printer in the world.

Digital fabrication is a field where research and experiments have seemed to be the only things stemming from these incredible new possibilities. Events such as the Fab10, however, are incredible catalysers for moving forward, as the symposium lectures have shown, by depicting a way less picturesque state of affairs as far as the integration of new technologies in the production loop goes. A few speakers such as Bruce Sterling and Alastair Parvin have taken the discussion about the wonders of digital fabrication into the real world of applied complex economic, political and international transport issues that are to be tackled in order for these practices to gain momentum and eventually replace the current means of production.

Looking at all this from the point of view of designer, we got a palpable confirmation that design as we know it is obsolete and co-creation, collaboration and open-source are guideline concepts/practices that we must pursue in our work as ex-architects. From a young architects perspective this story has so much of a collegial air to it that it makes us wonder why it took so long to make it happen. This type of experiments should be sprinkled throughout the curriculum of our university as early as the first year and students should be encouraged to participate, initiate and discuss.

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1 WikiHouse is an open source construction system. More details on their official webpage http://www.wikihouse.cc

2 An extensive description of the project is featured on Archdaily, the online database for architecture projects http://www.dezeen.com/2012/08/22/stone-spray-robot-by-anna-kulik-inder-shergill-and-petr-novikov/

3 Patrik Schumacher’s opinion about the situation of the newly graduated architect, as he states in an interview I took during his visit to Romania, is that the technical skills acquired by students in masters such as the AADRL at the AA are only useful if they are applicable in the jobs that follow their education. (Leonte, 2014: 148)

4 The Seed Cathedral is the design which represented the UK at the Expo2010 in Shanghai. It is an unusual construction consisting in over 60,000 acrylic rods mounted on a simple cube structure.

5 This remark refers to any retailers that are commissioning high-end innovative designs to promote their brands such as The Louis Vuitton Foundation designed by Frank Gehry with an undisclosed budget, or the BMW Corporation who commissioned Coop Himmelblau to design their museum, BMW Welt in Munich

6 FAB10 Barcelona is a one week of events focussed on open and accessible technologies that will change the world. It will gather the Fab Lab Network and the citizens of Barcelona to make it a FAB City. FAB10 Barcelona will gather the international Fab Lab community which has more than 350 laboratories based in more than 40 countries in the world, and will host the FAB Festival and Fab City Symposium, open to all the citizens of Barcelona. Source: https://www.fab10.org/en/home

7 The web address for the making of video http://www.youtube.com/watch?v=X1SV2djgOVQ

# RURALITY TODAY? LANDSCAPE AND HERITAGE SUSTAINABLE MANAGEMENT

**Mihaela Hărmănescu**[1]
[1]*Romania*
*mihaela.harmanescu@gmail.com*

**Abstract**

The democratization processes take into account the liberalization and spreading of the controlled decisions first at a central level, as far as space organization is concerned. They currently happen *ad hoc* and frequently threaten the quality of the landscape, therefore the impending need to implement a clearly defined set of regulations that would comply with the superior concept of sustainable development. The gravity of the situation can be seen in the fact that landscape policies, sustainable strategies and sustainable administration have become very important in the European Union's utterances.

Thus, a major interest – and somewhat urgent – is represented by the landscape, the unprotected landscape of everyday life. Because the landscape in Romania is vastly rural and agricultural, this research paper aims to promote solutions to problems in the rural environment that has lately been subject to a chaotic development. By knowing the potential of a rural landscape and by correctly applying its capitalization criteria, a sustainable strategy can be born. In order not to alter the relish of the landscape, the methodology of this strategy takes into account fundamental elements, the site culture of a rural settlement, identified within the project as *heritage* and *rural heritage.* How do we integrate the unprotected rural heritage? How can this be locally and nationally recognized and, moreover, integrated on a European level? How can the settlement evolve? These are questions that seek answers here.

To the extent to which they will determine the limits of these developments based on local community or individual resources in a self-administration manner, it is desired to find alternative development possibilities based on local resources that have yet to be capitalized. What is at the core of the proposed strategies is represented by compared studies and, mainly, field studies, the main interaction with the local communities.

**Keywords**: *sustainable rurality, landscape policies, local resources, rural heritage, authenticity*

## 1 WHY RURALITY?

The European Commission regards 'rural areas' as a spatial phenomenon – Rurality – that extends across regions, landscapes, natural areas, agricultural land, villages and others larger urban centers, pockets of industrialization and regional centers. It encompasses a diverse and complex economic and social fabric. It is the home of a great wealth of natural and cultural resources and traditions. It is becoming more important as a place for relaxation and leisure activities. This definition illustrates the breadth of the issue, but is not useful from an analytical point of view. The debate to define rurality have made extensive use of the concept of the rural/urban continuum to deal with many different types of area, exhibiting different characteristics, and areas undergoing active change: (a) population density and size of settlements; (b) land use, and its dominance by agriculture, forestry and different activities; (c) 'traditional' social structures and issues of community So, taking in consideration that rurality is referring *to the condition of being rural* and everything what is relating with that and to know the rural in the contemporary world is mean to focus on the representation of the complex assemblage of the relational rural [1].

Meanwhile, between rural societies and the territory that has been exploited in the past and present, a very deep bond was established which was strengthened by activities, traditions, customs and very diverse interests taking

into account it is a territory produced and maintained by human societies (both rural and non-rural), from economic, political and socio-cultural reasons. How the rural places are connected with the other places rural or non-rural through social, economic and political relations and the social and cultural forces associated with globalization have joined the local practices within territory, were generated major changes of rural places, diminishing the distinctive aspects which create the spirit of a place [2]. These transformations brought in a relatively short period of time a new series of severe modifications of a lifestyle which was once considered idyllic and romantic. Rapid industrialization, the accelerated rhythm of everyday life and the decrease of collective life quality have intensified more as the society moves towards faster informational and technological systems.

## 2 RURAL DEVELOPMENT

Rural development can be conceptualized as a process, a phenomenal, a discipline, but more important as a strategy, a strategy to improve the economic and social well-being, so to enable a specific group of people (here, rural people) to gain for themselves and their children [3]. Webster (1975) defines rural development as a process which leads to a rise in the capacity of rural people to control their environment [4], resulting from more extensive use of the benefits which ensure such control. Over time, it could well become a privileged area where beside their work environment; different social groups apply their own system of values, in other words, their tastes in leisure activity, styles of consumption, cultural preferences. To identify the elements (including the relations between elements) that give personality to the rural landscape is the basis for valuing (classification and hierarchy) of rural heritage, but it could become also operational as a basis for decisions on development policies, based on specific methodologies related to the value system of the rural and the relation with exteriority. Being a process, it implies to engagement the rural communities *to manage their rural space* and leading to a sustainable improvement in the quality of life of rural people.

### 2.1 Rural landscape and cultural heritage

Nevertheless, rural landscape, material component of the rural place, supports a certain type of social existence, a base for human life and food and industrial resources. Therefore we can state that within a rural landscape we can see more clearly how a community exploits a territory through means conditioned by technical, social, legal and historic factors, leaving a characteristic print on rural landscape which turns it into what we call *cultural landscape*. Rural landscape[i] is now in a delicate position. Therefore, the actual rural landscape comprises all existent past or possible rural images and it is under the imperative of evolution law is open work with continuous and inevitable transformation. Being a physical object and attribution of meanings and values by people, contemporary rural landscape *is cultural heritage*, an archive of many types of permanencies, material and immaterial. Participate in global culture and keep their distinct character, the rural heritage represents a driving force for sustainable development.

#### *2.1.1 Landscape value*

On all levels of the research we could notice the relation between *rural landscape and culture* which is a part of the cultural landscape concept and which is related to modernization, progress and sustainable development. This relation also involves territory and rural space implicitly. Starting from the premise *the rural landscape is a part of ordinary landscape* which still carries elements of identity and tradition better conserved compared to non-rural landscape, this type of integration (to cultural landscape) is necessary because it re-creates an identity that does not necessarily mean the old one is gone. Their development implies keeping valuable, traditional elements, part of the rural landscape uniqueness.

#### *2.1.2 Heritage value*

Maybe the most common idea of culture as heritage value (as potential) implies that it is possible that a specific set of cultural features is identified, which in time reflects the special essence of culture, identifying value by following the history of a set of features on a certain period of time. But culture is dynamic by its nature so to value it reflects more about the actual situation that sometimes essential historic values do. This refers to the inheritance of *an uncategorized cultural heritag*e which has to be transmitted from a social group to another. In this case the representation of cultural landscape through cause-effect relations is the foundation for rural landscape to be valued as heritage. Although rural landscape doesn't always have a historical value, it has gained popularity within conservation of heritage. That is why we present rural landscape as a messenger of heritage to assure a positive development and an intelligent management of society. Culture, as a dynamic element,

individualizes the characteristics specific to rural landscape as heritage which could also be considered consistent and defining for the sustainable management of rural landscape.

## 2.2 Landscape as heritage, heritage as landscape

In 'Supporting cultural heritage' [5] *'Cultural heritage enriches the individual lives of citizens, is a driving force for the cultural and creative sectors, and plays a role in creating and enhancing Europe's social capital. Moreover, it is an important resource for economic growth, employment opportunities and social cohesion, thanks to its potential for revitalizing urban and rural areas alike and promoting sustainable tourism.'*

Heritage does not deal strictly with conservation of buildings, artifacts and national parks but it is rather a holistic, dynamic and organic concept. Promoting this comprehensive view on cultural heritage is useful in order to reconsider the connections between society and its geography and to identify and enhance the value of rural landscapes.

Because on a global level there is an obvious tendency towards degradation and creation of less valuable markets (up to the point in which rural landscapes mean more than nature), development through conservation and protection of rural landscapes implies decisions which are not easy to take together with the need to review past theories in domains such as agriculture, viticulture, conservation of nature due to their complexity and the task to include the beliefs and values of all cultures.

Therefore, rural landscape as heritage is identified by directly relating with the scale of the territory, one of the constitutive elements when defining the characteristics of a landscape. Territorial planning also implies material and nonmaterial elements that are a proof for the special relations between the community and the territory during the years. There are characteristic elements that can be structuring at a macro scale and fundamental elements on a lower scale. The correct interpretation of an existent situation of ordinary landscape emphasizes the local potential and the chances for a further exploitation, guiding the study to a correct utilization of heritage local resources which have not been yet organized.

*Rural landscape as heritage* is necessary for a better *management, development and communication of territories.* Thus it marks and models the territory by different rules and methods to enhance the value of its resources and also identifies structural elements of cultural landscapes in a permanent interaction with a potential for sustainable development.

# 3 THE CHANGING LEGAL FRAMEWORK

The concept of landscape and the politics to preserve and enhance the value of the landscape in different countries are differentiated depending on the way the landscape is perceived and on the importance of cultural, heritage and ecological components. Is not about to identify common characteristics or a common method, considering this impossible due to landscape diversity and uniqueness, the common element in all legislations is the potential given by the way the cultural value of that country is protected, valued and managed. The purpose is to identify the way the culture of each country is integrated or differentiated within the landscape politics at a territorial level.

## 3.1 Existing instruments

The landscape politics represent a very vast subject and the conservation politics and legislation are directly related to the conservation of monuments, of heritage, but a common element *European Landscape Convention* which is a global concept that identifies and defines *the status of the landscape as a cultural and economic resource[6]*, following the specific tendency present in the legislation and politics regarding landscape in different European countries during the last decades. The policy mainly focuses on compiling inventories as well as protecting and managing valuable, cultural-historic landscapes. What's more, it aims to facilitate more general landscape care under the impulse of the European Landscape Convention. But, rural landscape is a continuing landscape [7] there is no international documents (declaration, recomandation,...) with principles and criteria to preserve, manage, etc…a "continuing landscape".

## 3.2 Future instruments

The future aims towards a scenario with minimum "external" interventions and maximum usage of local resources. From the point of view of applying the strategic plans of the different European models, "autonomy" of the rural areas will be sought. This "autonomy" must be doubled by flexibility and adaptability in the policies and programs as a response to the impending changes that will appear, through comparative analysis on a European level.

The importance of this is strongly linked to determining already existing development tendencies in the rural local communities, due to mobility, globalization, and other factors. It aims to analyze the possibilities and limitations these "bottom to top" development present and to determine, as a consequence, a general sustainable management setting for rural settlements. It should be focuses on policies of protection towards fundamental elements possibly threatened by chaotic development tendencies that already exist which changed the identity and on promotion strategies for the Rural Landscape and its relation with Heritage, Culture and Sustainable Management.

## 3.3 Management process

It is very important to include evaluation in the classification and description of rural landscapes and to concern not only ***outstanding places****, but all rural places.*

Management of rural landscape involves also different categories of people - main stakeholders: local communities, professionals (from educational level to experts and local activities), decision makers, etc. In this management process, each specifies category is able to identify key value, to develop visions that reflect their diversity but also to establish different directions to achieve objectives and to develop actions for appropriate transformation.

## 3.4 Romanian case

Romania is facing a 69 years discrepancy between the perception and behaviour concerning patrimony, especially towards the unprotected, rural one, aspect that justifies the importance and urgency of recognition of its *inherited cultural value*, taking into consideration the fact that this is not related to rare episodes, simple typologies or architecture, but with models of settlements in a significantly extended territory. Besides that, we have general observations, regarding landscape planning on a national level taking into account the fact that organized efforts to maintain and obtain certain qualities of the territory are more recent in our country. The Romanian legislation synthesis the perspective of landscape as a resource, in order to identify and enhance the value of rural landscape. Taking into consideration that almost half of the country's inhabitants are living in rural areas, according the spatial planning of Romanian "Charta Verde, Rural space zoning, Rural Development"[8], rural settlements play a fundamental role in the framework of the contemporary landscape, urging the construction of a world that wants to find its landmarks, equilibrium and safety, a world that will find in patrimony the tools, ideas and knowledge of this search, but also inspiration towards a new modernity. Last but not least, the landscape heritage is analyzed. This topic is encountered at conventions, directives and agreements accepted on a European level that refer to landscape and of which Romania is a part of in the context of sustainable development of landscape.

# 4 REGENERATING THE RURAL

*Rurality resilience:* Is about the capacity of the communities, of the individuals, local administration to help the rural to survive, to adapt to the new challenges. It's about rediscovering the experience capital gathered generation after generation and patiently passed forward, dictating the balanced organization of the territory, the dialogue between fundamental elements of the rural settlement, the sustainable management of natural resources, the art of building and to protect from the natural and climatic environment, but at the same time shaping the organization of human societies, the art of living and the lifestyle in that community. The interaction between experts and locals is very important, the way local people react and how we respond to locals, to the rural mentality, *to rural problems, thus the role of the expert in the village and real actions in the rural environment* [9]. The sustainable management intent is, by the initiated activities, to help towards a better awareness of the extraordinary importance of their rural places, of its resources and heritage and, especially, of the community that they are part of – *as a single binder and an element for stability and continuity*.

This alternative development doesn't have a deadline; every moment of interaction between locals and experts is a landmark. The continuity offers a marking of the place, of the direction of a community and reminds us that rural life is far more complicated and with consequences in the rural landscape.

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[i]Rural landscape is not just the land where agricultural and pastoral activities take place. It also serves for industrial and commercial activities, as a place to unwind, a residence place for population who works in agriculture and other fields as well.

# FOOTBALL ARENA – A MULTIFUNCTIONAL SPACE

**Radu Sfinteş**[1]

[1]*University of Architecture and Urbanism "Ion Mincu" (ROMANIA)*
*radu.sfintes@gmail.com*

## Abstract

Improving life parameters, directly related to urban space, can start even from the football stadium. This sports arena, along with its related spaces, can become a generator of daily activities oriented towards the end user. The preconceived idea that this space belongs only to the supporters can be changed gradually by introducing, inside the arena, the functions requested by the area it serves. After all, creating conditions of life, similar to those of the big cities, it's a necessity for any location. In addition to the essential requirements related to accommodation, food and services, the functions that the town offers to citizens must satisfy the needs of leisure, of access to culture, entertainment and so on. Especially in this area of functions our new type of proposed sports arena can intervene with innovative ideas.

Romania has a great potential in building new arenas which could satisfy the requirements mentioned above. In the last 20 years we haven't seen major investments in this field of architecture. The few football stadiums built in this period, however, don't meet the criteria to fit in the proposed design for modern arenas. Limitations, since the design phase, led to elimination of related functions (such as: catering, restaurant, bar, souvenir shop and so on) and so have increased the payback period, which translates into a reluctance of those with the power to make decision (both at the level of the club and at the local or national level) to modernize existing stadiums.

This paper aims to argue the need to implement a wide range of complementary or opposite functions into the football stadium. This space should become a multifunctional centre which could serve the local interest, not only in terms of the "show" provided by football matches but also by organizing cultural events, social, recreational events and so on. Also we try to present another possible side of this space, which has suffered from its association with the image of hooliganism phenomena. Football arena must regain the value to reconnect different social strata, different cultures, to facilitate the organization of sports meetings (one of them being the football, but we shouldn't be limited to it) and cultural events.

The current image of football stadium has to be changed. In modern society the limitation of a space to a certain segment of population could mean its disappearance. Eventually even the *king of sports* is a business; a business in which money are invested and from which you want to obtain a profit. The football club has as main source of income the football team. Based on the results of this team the football club can obtain income. It goes without saying that the team placed in the top rankings start gaining more and more and thus becoming a successful "business". Gains may be direct (money earned from: television rights, the position in the final standings in local and international competitions, advertising contracts, the selling of football players etc.) and indirect (first of all relate to growth of: the number of supporters, the interest of companies for advertising and so on).

As you can see, as in any system that has reached a certain maturity, we identify a sort of a closed circuit in which stratification has become precise between the top teams, platoon and those that are fighting for relegation. The accession of a lower category team into a superior one occurs with a great financial effort by the owner of that football club. In this certain

equation we try to introduce the new system of the football arena. Based on this new way of designing football arenas as multifunctional space, we believe that we can insert a new equation in this closed system to further boost the direct and indirect gains.

**Keywords:** sports arena, football, hooligan, multifunctional space

Improving the life parameters directly related to urban space can start even from the football stadium. This sports arena, along with its related spaces, can become a generator of daily activities oriented towards the end user. One of the important issues facing this challenge, however, is the phenomenon associated with football hooliganism and thus to stadiums. Hooliganism is defined, according to Oxford Dictionary as a "violent or rowdy behaviour by young troublemakers, typically in a gang"[1]. The definition is greatly simplified so that it can be easily understood by anyone. With all of this said we are faced with a phenomenon that defined a new lifestyle, a new vision of life, a new meaning for those who adopted this behaviour.

Although there have been researches that addresses the problem of hooligans ([2],[3],[4],[5]) or safety issues for the spectators on stadiums ([6],[7]) there are few that try to make a connection between these determining different factors and the design of the architectural object. Also, the results of the implementation based on the conclusions of the research in the design of football arenas, are not clear yet, at a social level. By reference to the globalization of the hooliganism phenomenon and due to large differences between British society (in which the hooliganism took shape and from where it spread, then, under this name) and the European / Romanian society, we will try to demonstrate the usefulness of a new way of tackling the problems posed by football arenas. This should start from the design of the architectural object which must consider all the factors involved - social, political, cultural, and also the financial factor, very important because of the high cost of such an investment (which must be redemptioned as soon as possible).

The preconceived idea that this space belongs only to the supporters can be changed gradually by introducing, inside the arena, the functions requested by the area it serves. After all, creating conditions of life, similar to those of the big cities, it’s a necessity for any city and the architect Le Corbusier, in 1938, considered the stadium to be "a civic tool of modern times"[8]. The migration of people from villages to cities, from poor countries to richer countries has been a continuous phenomenon that gained momentum only in the recent decades. Improvements in communication and transportation, the large-scale implementation of economic principles based upon monetary exchange and the diminishing-until-extinction exchange of goods on the basis of barter, as well as an increasing awareness concerning the social role of the person with secondary or higher education emphasized this continuous migration process. In addition to the essential requirements relating to accommodation, food and jobs, the city, through the functions it provides to its citizens, must satisfy the desires of relaxation, cultural entertainment and so on.

One of the sports widely loved by large masses of citizens is football. It is a sport that can be practiced relatively easy with a small group of friends (you only need a pair of sport shoes and a ball), it can be played anywhere and on any ground, watched at television or directly on the stadium, and, also, it already has a dedicated media industry and so on. All these elements listed above (but not only) can be considered among the strengths that turned football into the king of sports ([3],[4],[5]). The existence of sports arenas which could host this type of events further emphasized the process of transformation, into a sport that could be played at a

professional level, and which could be anxiously watched by fans. At this moment we could believe that we are dealing with an interpretation of an ancient Roman gladiator show, which can "indulge" the masses, creating a space where the spectators can outpour all their problems, accumulated over a period time

“After a full week of being serious, I like to let myself go”.[3, p. 11]

The fact that the stadium has been used as a space for political congress had a major impact upon the political thinking and also upon the willingness of politicians to invest states money in them. From this point of view the stadia of today aren’t dependent upon this old ideologies, the major investments in them being made with private capital, usually by the owners of the football club of that region. Following a special design, because of its good acoustics and the large number of spectators a stadium can accommodate, it was possible to successfully organize music concerts, from rock (07/12/1986, concert Queen, Wembley Stadium, 72,000 spectators) to classical music (11 Jun 2011, Andre Rieu concert, Amsterdam ArenA- 85000 auditors), to transform it into spaces for people in times of natural disasters (2005, Hurricane Katrina, Louisiana Superdome) as well as into spaces for political rallies (20/09/2014, presentation of a presidential candidate, National Arena - Bucharest, 70000 party members).

Obviously, every event targets a particular audience and thus safety measures vary from show to show. However, stadium, in all its ensemble, would have to be designed and put into operation only after it meets all the safety requirements. Legislation is adapted to prevent tragic events or situations that already happened and imposes not only a vision, but also tries to avoid the same kind of situation from happening again. Just from this point of view the tragic events that occurred in 1985 at Heysel, Belgium, (39 people killed and 600 injured) and in 1989 in Hillsborough, England (96 people killed and 766 injured) determined the authorities to identify and implement more stringent measures that would improve the safety of spectators.

We must not forget that all these events were, to a certain extent, ([2],[3],[4],[5], [6],[7]) the product of a new society, helped by the mass-media to find a purpose. As in any system, we can discuss about the action-reaction effect that is occurring in the face of a new stimuli. By introducing a new triggering factor (like the sports topics that appeared in the media) in a system relatively stable at a certain time, we notice good changes (for example, increasing popularity of the club and so the attraction of new fans etc.), but at the same time imbalances /voids (crams at the ticket offices or crowded stadia, ineffectiveness to process that large number of supporters, the lack of – or under rated – transportation system for the large number of fans who came to attend the event and so on). In fact, we do not always have to deal with negative elements that can not be solved immediately, but, in the case of football, such voids have been quickly filled by the appearance of supporters willing to act violently – the hooligans.

In a brief presentation ([4],[2]) of the official documents that describe the appearance of hooligan acts unfolded by citizens, from various areas, we can see that this ***rebellion after a game*** is not following a particular sport or on a certain date, but is a ***normal phenomenon*** since the Middle Ages (according to data presented by Carnibella and colleagues in their report “Football violence in Europe”, in the year 1314 we discover, in England, the first official document in which King Edward II is forbidding football; starting with the year 1349 we see a pattern used-up by the kings of England to ban football due to violent disposition among the practitioners of the sport [2, p. 27]).

In this equation, the new factor is media which has managed to create spectacular topics that attract population and amplify hooliganism all around the globe (“We are the famous hooligans, read all about us” [2, p. 37]). As consequences of these ***sensational reports*** created

by the media, the king of sports had both to win and to lose. The sport with the round ball gained a greater audience but, on the other hand, it lost by being inevitably associated with hooliganism, causing changes in the architectural design of the stadium, based on this stigmatization.

The stadium can be the point from which changing the image of football can start. Its influence upon the society is huge, being able to shape (quite positively) a person's traits. The contact between supporters and football starts from toddler ("Taking my boy to his first match. […]. I knew then, there, I had created a Red who would care as passionately about the team as I do. Poor little sod …"[3, p. 36]), it does not stop even during adolescence and continues into adulthood - "The Romanian ultras has studies, comes from a good family, is gregarious and easily influenced"[i] [9]- come to close the cycle by bringing their child to the sports arena. Obviously, the way of interaction may be different from stage to stage, as the perceptions of that space differ as well (for the young person it is a way of expression and rebellion against his parents, a space full of possibilities; for the adults - a space of recreation and relaxation, a way of charging/discharging batteries for a new working week - as the worker quoted above mentioned).

The existence of such a typology of individual transformation from teenager to adult, based on the interaction covered in the stadium arena, sets the stage for the transformation of the space in which only the football shows take place into a multifunctional space, allowing a wide range of new additions to the existing function. The stadium should and can become a permanent activity space in which a wide audience can find its place (by proposing other functions like: museum, cinema, shops, administrative area for the community etc.), not only passionate fans, eager to bolster their favourite team.

The Football arena has to emphasize the potential of a space by creating connections between different social strata, between different cultures, by facilitating the organization of cultural and sport meetings (one of them being the football, but we shouldn't be limited to it). In this period, building only stadia dedicated to the king of sports, or at most sports that can be played on the ground (e.g. rugby), is a regrettable limitation. The accommodation of diversity by organizing various events and bringing in athletes practicing any sport completes the new vision highlighted in this article. The usefulness of the stadium should not be confined only to sporting competitions, as I described above. These spaces, once they became morally exhausted or have fulfilled their role for a certain stage in the evolution of a club, have been converted into residential islands (Highbury Square - the project that transformed, in 2009, the former Arsenal Stadium FC, Highbury in a residential complex with 650 apartments[10]) or generated proposals for their transformation into prison ("Arena da Amazonia" in Manaus, Brazil- intention of changing the function). All these solutions have been identified and eventually applied precisely because of the need to recover the initial investment or to produce an even higher profit.

The stadium has undergone many transformations over the years, from "The Hillsborough Stadium Disaster" inquiry by Lord Justice Taylor, also known as the "Taylor Report" (report following the Hillsborough incidents with the main purpose of finding the causes of the accident and to propose measures toward increasing the safety on stadiums for the future) to the measures that were implemented in order to adapt the arena to current sustainable requirements. It should be pointed out that a number of measures recommended after the above mentioned report have also been expressed by Sir John Lang in this document compiled and published in 1969 entitled "Report of the Working Party on Crowd Behaviour at Football Matches". However, it was necessary, unfortunately, for 20 years to pass and hundreds of people to be injured by incidents on stadiums to raise a serious concern for safety issues on sports arenas. Many years had passed since World War II, mentalities, as well as

generations changed, and unnecessary loss of lives during football performances were no longer accepted as natural and careless. However, some solutions were easily imposed, because of the direct impact they had on the football phenomenon (video monitoring system - CCTV, stewards, seats, etc. legitimation supporter entrance - which increased safety stadium) while others have been removed in order to better highlight the main show. One such element was the running track.

The desire to bring the supporter even closer to the playing field and implicitly to the players led to the reduction of the distance between the stands and the pitch. Unfortunately, the solution has revealed its gaps in counted rows as it followed a sketchy analysis of the problems generated (running tracks, in the case of football matches, could act as a buffer zone where the stewards could stop any attempt to disrupt the sporting spectacle made by hooligans). Failure to report on to social criteria, to psychological factors and to the needs and desires of the specific population in a given geographic area entails shortcomings in the project design, that are sanctioned later by those fans eager to prominence in the group.

The episodes which occurred in Romania in 2011 ("Ilie Oană" stadium – Ploieşti; sporting event: Petrolul Ploieşti - Steaua Bucharest; incident: a supporter of the local team entered during the game on the playing field and physically assaulted a player of the rival team, producing him a fracture of the zygomatic bone) and 2012 ("Arena Națională" stadium - Bucharest; sporting event: UEFA Europa League final, incident: a supporter of a disaffiliated Romanian football team tried to warn the foreign officials about the abuses that he believed were conducted against his favorite team) raise big concerns on how generally accepted solutions have been implemented locally.

In both cases – though, unfortunately, they are not the only ones that can be presented –we are discussing of a lack of vision necessary to satisfy requirements, as solutions achieved in other countries have been adopted and implemented without a thorough analysis, and the owners of stadia show a low interest in reducing this kind of common manifestations which, consequently, are not framed into design rules. Limitations, imposed from the design phase, determined the elimination of related functions (such as: catering, restaurant, bar, souvenir shops etc.) which increased the payback period, leading to the reluctance of the managers, at both the club level and at the local or national level, to modernize existing stadiums.

The mentioned problems are not necessarily related to a particular decision maker but, unfortunately, they are the result of a sum of factors. For the achievement of modern designs we plead for multidisciplinary design teams, including from sociology to law enforcement specialists, so that each of them could bring their own expertize and new perspectives in thinking and designing sports arenas. The task of the newly formed design team would be to find solutions to problems raised by team members, supporters, community etc. Precisely because of the need to respect the rules (regarded as the minimum standard for any modern sports building) imposed locally or by international institutions, in the case of Romania we can discuss of a possible advantage: the low number of stadia, raising to international standards, determine a need to build new sports facilities that can be designed, from the beginning, to comply with all international rules but we shall not stop there. Thus, all these new spaces necessary to achieve a modern arena can be much easier implemented.

The construction of such modern projects would result in a shift of supporters towards the stadium (Romania – the case of the league champions when they dispute games in different arenas against league rivals: “Arena Națională” - modern stadium (October 31, 2014 - against Dinamo Bucharest) - 38,154 supporters; “Ghencea” stadium (February 22, 2015 - against Rapid Bucharest – 9437 supporters), and would represent an opportunity to promote both the

sport and this country by organizing and hosting major sporting events at an European or global level.

In modern society, limiting the access to a space to a certain segment of population could lead to its disappearance. Eventually, the king of sports is a business; a business in which you invests money and from which you want to draw profit. The Football Club is the main source of income for the football team. Based on the results of the team, the sports club can get income. It goes without saying that the team placed in the top rankings starts gaining more and more and so it becomes a successfully “business”. Gains may be direct (money earned from: television rights, position in the final standings in local and international competitions, advertising contracts, sale of players etc.) and indirect (primarily relate to growth of: the number of supporters, of interest advertising companies, the attractiveness of a football team for top players in the sense of wishing to transfer).

Regardless of how we relate to a football team, eventually we may reach the sports arena in which the team is playing. As explained above, a stadium has a certain capacity to absorb this new influx of fans attracted by the results of the team. The measures implemented after Heysel and Hillsborough incidents have been, among others, even about reducing the number of fans in the stadiums. The requirement for any stadium (upper leagues or participating in international competitions) to have chairs has reduced, in some cases drastically (Slaski stadium, Chorzow, Poland, the initial number of standing places - 100,000; after modernization the number of seats was 54 800), the number of tickets sold, which ultimately translates in lower revenue and profit.

The solution followed by big clubs was to construct a new, modern stadium, which could highlight the new position of the club, as well as to accommodate the increasing demand, of the home supporters, to purchase subscriptions or tickets. The transition from one stadium to another could create difficulties for the club budget which would have implications in all other areas (see FC Arsenal London - in 2006 they completed the construction of the new stadium "Emirates Stadium" after an investment of £ 390million. Although the modern arena is superior to their old Highbury stadium, we can observe a decrease in the performance of the football club because of the limitations imposed after that big building investment).

As you can see, as in any system that has reached a certain maturity, we speak of a closed circuit in which stratification is done in time, precisely between the top teams, platoon and those that fight not to relegate in lower leagues. The accession of a lower category team into a superior league occurs with a big financial effort done by the management of the football team. The football team that is generating income has assured, most likely, the possibility of remaining at least in the same place in the local championship. Orientation towards new continents and thus the promotion of the sport in those regions generates new fans and new revenue to the club. The organization and coordination of these marketing movements have the purpose of generating profit which could be reinvested afterwards in the club (in buying players or in the sports arena).

There have also been proposals to introduce new international competitions in order to organize high profile games in which the very best teams of the moment would play, but due to the currently competitive program this idea was postponed. Changing the current system with one game in 3 days (refers to top teams which are participating in both domestic competitions [Championship, league cup and so on] and in international competitions [in this category we can introduce the fact that most of the top teams have national team players who must participate in those matches also) with the purpose of generating other football matches is not, at this time, physically possible.

What I want to highlight is that most big clubs are trying to obtain a more rapid expansion and increase in their income. The profit generated by future sports arenas created as multifunctional spaces can still be included in the category of the most unharnessed resources. Through this refunctionalisation into a multifunctional space for sports, we believe that the stadium can generate revenues even during competition or technical breaks (land restoration, recovery time for players etc.).

Precisely in this equation we consider beneficial the introduction of the new football arenas system. Based on this new way of designing the football arenas by refunctionalisation into a multifunctional space, we believe that we can insert a new equation in that closed system to further boost the direct and indirect gains (gains not only material, but also social). The proposals in this regard are for increasing the secondary spaces, the non-football related spaces, that could attract the general public in the intercompetitional periods when the stadium is used lesser. Once we insert daily activities in this area, currently reserved only to the king of sports, we can even look towards a sustainable development of these arenas, trying to reduce the cost of maintenance to an acceptable amount.

When several factors (affordable budget, a vision of the decision makers on an objective, understanding the role of an architectural object) reach a common denominator and the design theme is formulated accordingly in order to begin work on a modern arena, the design team is ready to respond to this request. A good example of writing the requirements that would be implemented in the project following the competition is represented by the project for building a sports complex and operating an urban reconfiguration in Lausanne, Switzerland. The functions required in the task were: to design a stadium with 13,000 seats, a boarding school, a swimming complex, administrative offices for the local city hall, parking and recreational spaces for the municipality and the creation of a residential neighbourhood near the stadium. The interconnection of these different functions contribute to the achievement of a new urban pole. We do not speak any longer about an architectural object – the stadium - "cast-off" in an area with available free land, that would later attract other functions, depending on the possibilities. This assembly in Lausanne is designed as an unity, it will be built over a period of 4 years, and the final results are known by all the decision makers. Due to the way of thinking required by the design theme, the sports arena supports the local community through the functions proposed inside.

The existence of such new non-football related spaces can cause a much greater binding between sports and common people, thus generating a new economic resource for the club and community. Keeping in mind the way the stadiums were constructed up until this moment, we see a possibility of adaptation to the new sets of criteria as open land is available in many situations. Finally, a thorough analysis should justify decisions like keeping and adapting the current stadium to new requirements or designing and building a new one.

This new space for sports needs to discover its own advantages and host as many spaces for different functions. In fact, we believe that the new proposed sports arenas should become a sports mall, with permanent usage, that would bring together visitors, users and consumers. Mentalities must change and we must understand that supporters attend a sporting spectacle. Returning to hooliganism, we believe that through their created illusion of ownership towards the built space it is possible, based on the new principle of the new arena, to modify the deviant behaviour of a group of individuals partially disinterested of the show but extremely interested in their own image and their acceptance inside a group.

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[i] Our translation; in original - "Ultraşul mioritic are studii, provine din familie bună, este gregar şi usor influenţabil"

# IMPROVED METHODS AND TECHNOLOGIES FOR POSITIONING ON TUNNELLING AND UNDERGROUND STATIONS

**Oancia Darius Marius**

*[1]UTCB (ROMANIA)*
*oanciadarius1984@gmail.com*

## Abstract

In the modern world of underground constructions are essential components of the infrastructure.The most representative points of the communication are railway tunnels and roads. Communications for railway tunnels are representative of the most representative group of underground constructions because of values, size and economic role social.

The development of modern underground parallel architecture that environmentally responsible design of energy crisis 1972. They grew up as separate branches of the same tree moving about independently and attract different nesters. In a way, their connection is generally overlooked.

Innovative technologies (immersed tubes, frost, jet grouting, pipe-jacking, chemical injections) have enabled underground construction land and difficult conditions.

Architectural volumes highlighted by shadows and light, direct participation of images expressed by the city assembly building facades not found in modest bouts of downhill underground. Directions predominant flow of passengers, their correlation with urban passages and architecture scene, as riparian areas and construction, location determine accesses in subway stations. Subway, building without facades, architectural ensemble appears frequently represented only by this accesses. Specifics architecture subway stations built in Bucharest architecture is totally different from any other buildings

Each technical element was reconsidering his aesthetic origin. Structural elements or installations routes were born in planimetry games or vertical planes ceilings, moldings and pilasters strips in architectural formulas which in turn became separate notes for each architect.

A new approach is looking for a solution for maximum integration Metro access from the urban context. Access is via a steep staircase that invites people slowly coming out of the subway station to a potential market. Square will host events and presentations several times a week and also parking facilities for bicycles.

Another example would be the design consists of a series of rectangular volumes. A skylight brings natural light below ground level platforms, which are accessed by escalators.

For stations may be exposed mainly based on "full flex", which provides more flexibility for future platforms for future groundwater and other transport networks.

It can be used to incorporate roof garden or minimize the footprint of the building, but this view completely underground possibility of designing spaces for human component.Daylight and lines of sight can act as important parameters to create an environment sigur.Statiile for example can become regional and local train stations. Materials that can be used: structure stainless steel fiber concrete, fiber cement, concrete, glass, teak details and rails. Thanks to the materials that can be

used (wood, warm colors) and a strong presence of nature, these places are a place to 'live', a combination of user-friendly and sensory atmosphere.

There are different interpretations of terms such as green building, sustainable design and green architecture, but one set of the most detailed and widely accepted criteria is leadership in Energy and Environmental Design (LEED) rating system developed by the US Green Building Council

Noise control is a primary consideration in the construction of an underground town or school.

Underground buildings are practically tailor-made for achieving LEED certification. However this pun is used in particular for underground parking

Measurement specialist must know the general requirements relating to the preparation and approval of projects, general technology through various methods of execution of construction and construction work required during operation. Given that the work is carried out in the absence of topographic natural light in confined spaces and generally required after tracks, it is natural to put the issue of adaptation or occurrence of specific equipment or work methods.

Use of equipment is tied and methods used in the execution of works.

The works executed in the creation or expansion of the network of underground extistente are demanding due to the high level of precision required to achieve them.

For execution of the resistance structure of subway stations is intended to introduce technical molded walls. Molded walls is long and deep walls located below ground level concrete poured. Can be molded wall thickness of 50 cm to 120 cm and depth varies between 15 m and 60 m.

Molded walls are used for deep excavations to provide resistance and waterproof. They can be installed in close proximity to existing structures without affecting in any way the foundation structure. An example of the use of the walls is molded in the case of crowded urban areas, in order to provide an appropriate retention system. In some situations, when architects approve relative resistance to water, molded walls are used as exterior wall structure for the future. The walls are called skinny straps when used as a foundation, like pillars. The cut is performed mainly mechanically using appropriate equipment: bulldozers, excavators, draglines, etc. These machines can be placed either inside or on the edge enclosure fence of the site where space permits. The last 20-30 cm of excavation is performed manually to achieve rigorous share and cut the required design in order to achieve the slopes required by the project.

In the planimetric determinations are most commonly used for stage totale.For a leveling stations (trigonometric) they do not provide enough accuracy to ensure good as the requirements of the rules of work.To determining the third coordinate of a point is used geometric leveling or hydrostatic leveling.

A new concept has changed the rapid determination of the spatial position of objects, which is based on laser scanning 3D.This concept was taken and geodetic measurements, because through this technology can be automatically determined the geometry of an object without using a medium reflective measurement precision and high precision.The result is represented by a set of points, called "point cloud".

Due to the obvious advantages of laser scanning such as: measurement without having any direct contact, high precision, long distance action, the rapid acquisition of information, etc., other areas such as architecture, urban development, judicial and industry leisure little by little start to adopt this technology.

There are solutions of issuing positioning methods using combined methods using specialized software or total . Total stations have implemented this software or total stations are connected to a computer via Bluetooth or data cable.

For a good development activity will require a follow-up of the constructions.A very best way is to compare the measurements made by traditional methods with those achieved using laser scanner.

Another concept also involves taking certain information from so-called slope (using inclinometers.)

Inclinometrele are the tools most often used to monitor lateral movements of the earth in areas of landslides and embankments. There are also used to monitor deviations retaining walls and pipelines subject to charges.

All the above methods provide improvements over known methods so far.

They can be further improved if softwares improve data processing and if they are stored in a database.

This article is designed to awaken developing new ideas for engineers, surveyors,architects and designers used on underground structures.

"Underground buildings can not be the right choice for every project, but they deserve to be considered on an equal footing with other options" (Loretta Sala).

**Keywords**: Tunnelling, underground, shadows, full flex, molded walls, inclinometers, piping, subway stations.

## 1 INTRODUCTION

In the modern world of underground constructions are essential components of the infrastructure. The most representative points of the communication are railway tunnels and roads. Communications for railway tunnels are representative of the most representative group of underground constructions because of values, size and economic role social. The development of modern underground, similar to architecture trend, was strongly influenced by the environmentally responsible design after the energy crisis in 1972. They grew up as separate branches of the same tree moving about independently and attract different nesters. In a way, their connection is generally overlooked. Innovative technologies (immersed tubes, frost, jet grouting, pipe-jacking, chemical injections) have enabled underground construction land and difficult conditions.

### 1.1 The need to approach the topic

Underground construction is a special group in the general area of construction. Despite the difficulties encountered in construction, underground construction showed a keen interest in all periods of human history. Given that what is done in underground works are carried out in the absence of natural light in confined spaces and generally bound by paths, it is natural to put the problem of adaptation or occurrence of specific equipment or work methods.

## 2 ARCHITECTURE AND METRO ARTS

Architectural volumes highlighted by shadows and light, direct participation of images expressed by the city assembly building facades not found in modest bouts of downhill underground. Directions predominant flow of passengers, their correlation with urban passages and architecture scene, as riparian areas and construction, location determine accesses in subway stations. Subway, building without facades, architectural ensemble appears frequently represented only by these accesses. Specifics architecture subway stations built in Bucharest architecture is totally different from any other building.

[1] UTCB (ROMANIA)- Technical University of Civil Engineering

Each technical element was reconsidering his aesthetic origin. Structural elements or installations routes were born in geometry games or vertical planes ceilings, moldings and pilasters strips in architectural formulas which in turn became separate notes for each architect.

"Fig.1 Architecture and Metro Arts"

A new approach is looking for a solution for maximum integration Metro access from the urban context. Access is via a steep staircase that invites people slowly coming out of the subway station to a potential market. Square will host events and presentations several times a week and also parking facilities for bicycles. Another example would be the design consists of a series of rectangular volumes. A skylight brings natural light below ground level platforms, which are accessed by escalators. For stations may be exposed mainly based on "full flex", which provides more flexibility for future platforms for future groundwater and other transport networks. It can be used to incorporate roof garden or minimize the footprint of the building, but this view completely underground possibility of designing spaces for human component. Daylight and lines of sight can act as important parameters to create a safe environment. The stations for example can become regional and local train stations. Materials that can be used: structure

stainless steel fiber concrete, fiber cement, concrete, glass, teak details and rails. Thanks to the materials that can be used (wood, warm colors) and a strong presence of nature, these places transform into living spaces, a combination of user-friendly and sensory atmosphere. There are different interpretations of terms such as green building, sustainable design and green architecture, but one set of the most detailed and widely accepted criteria is leadership in Energy and Environmental Design (LEED) rating system developed by the US Green Building Council. Noise control is a primary consideration in the construction of an underground town or school. Underground buildings are practically tailor-made for achieving LEED certification. However this pun is used in particular for underground parking.

## 3 NEW METHODS AND TECHNIQUES USED IN THE CONSTRUCTIONS OF UNDERGROUND

Measurement specialist must know the general requirements relating to the preparation and approval of projects, general technology through various methods of execution of construction and construction work required during operation. Given that the work is carried out in the absence of topographic natural light in confined spaces and generally required after tracks, it is natural to put the issue of adaptation or occurrence of specific equipment or work methods. Use of equipment is tied and methods used in the execution of works.
The works executed in the creation or expansion of the underground network are demanding high level of precision to achieve them. For execution of the resistance structure of subway stations is intended to introduce technical molded walls. Molded walls are long and deep walls located below ground level concrete poured. Molded wall thickness starts with 50cm up to 120cm and depth varies between 15m and 60m.

"Fig.2 Execution of molded walls in subway stations"

Molded walls are used for deep excavations to provide resistance and waterproof. They can be installed in close proximity to existing structures without affecting in any way the foundation structure. An example of the use of the walls is molded in the case of crowded urban areas, in order to provide an appropriate retention system. In some situations, when architects approve relative resistance to water, molded walls are used as exterior wall structure for the future. The walls are called skinny straps when used as a foundation, like pillars. The cut is performed mainly mechanically using appropriate equipment: bulldozers, excavators, draglines, etc. These machines can be placed either inside or on the edge enclosure fence of the site where space permits. The last 20-30 cm of excavation is performed manually to achieve rigorous share and cut the required design in order to achieve the slopes required by the project. For the projected determinations there are most commonly used total stations. The leveling stations (that are using trigonometry) do not provide enough accuracy to ensure good as the requirements of the rules of work. To determining the third coordinate of a point is used geometric leveling or hydrostatic leveling. A new concept has influenced the fast determination of the spatial position of objects, which is based on laser scanning 3D.This concept was taken and geodetic measurements, because through this technology can be automatically determined the geometry of an object without using a medium reflective measurement precision and high precision. The result is represented by a set of points, called "cloud points". Due to the obvious advantages of laser scanning such as: measurement without having any direct contact, high precision, long distance action, the rapid acquisition of information, etc., other areas such as architecture, urban development, judicial and industry leisure little by little start to adopt this technology. There are solutions of issuing positioning methods using combined methods using specialized software or total. Total stations have implemented this software or total stations are connected to a computer via Bluetooth or data cable. For a good development activity will require a follow-up of the constructions. A very best way is to compare the measurements made by traditional methods with those achieved using laser scanner. Another concept also involves taking certain information from so-called slope (using inclinometers.)

“Fig.3 Portable and In-Place Systems (the inclinometers)”

The inclinometers are the tools most often used to monitor lateral movements of the earth in areas of landslides and embankments. There are also used to monitor deviations retaining walls and pipelines subject to charges. To determine the displacements inside the walls will be used inclinometers installed in piping specific guidance and protection, inclinometer are inserted into

a metal pipe fittings connected to the enclosure wall before concreting them. Piping inclinometer is mounted vertically, up to the maximum depth of molded walls of stations, pumping stations or power of ventilation. Specific piping will be installed so that the grooves for guiding inclinometers allow recording displacements perpendicular to the wall of the enclosure. Measurements can be made:

- Continuous, in which case the drill string device is mounted so that it can be seen massive ground over its entire thickness, and data are stored in an electronic device that can store information in order to collect by an operator or automatically transmitted to a central storage and data interpretation.

- Periodically, in which case a set interval, drilling operator introduces a tilt sensor recording, then, after recording the data, remove the sensor. The inclinometers for tracking stability of molded walls must meet the following requirements: high resolution, accuracy, repeatability, operating temperature, and high strength structure and motion graphics performance monitored through a special software. The methods can be further improved by using them and by storing and processing data in a database.

## 4 CONCLUSIONS

This article is designed to awaken developing new ideas for engineers, surveyors, architects and designers used on underground structures.

New technologies currently used in underground construction, requiring interconnectivity between geodesy, architecture and construction.

"Underground buildings cannot be the right choice for every project, but they deserve to be considered on an equal footing with other options" (Loretta Hall).

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# INNOVATION IN LIGHTING DESIGN, EXPERIMENT AS LEARNING TOOL

**Cristina Pană**

*Ion Mincu University of Architecture and Urbanism Bucharest (ROMANIA)*

## Abstract

Lighting design is part of architecture, where innovations succeed with high speed in the recent years. New technologies have opened new possibilities for lit environment, which architects and interior designers need to learn and to experience for integrating in their projects. The LED-s can change the fastest the atmosphere of a room, both in intensity, but also in terms of colors of light. The LED dimensions and long life time offer new architectural solutions and specific details for indirect lighting or lit surfaces. A contemporary interior can and should have a flexible lighting solution, including the newest control systems, which allow the selection of different images and emotions, by a simple touch of the screen of a table or a smartphone. Students must learn and experience all this possibilities, even the technology changes so fast...

**Keywords**: lighting design, light, theory, technology, LED, innovation, light art, experiment

## 1 INTRODUCTION IN LIGHTING INNOVATION

Lighting design is part of architecture, where innovations succeed with high speed in the recent years. To be able to transmit the latest achievements in architectural lighting, first of all the teachers must be permanently updated with the new technologies. Last December we had a full workshop day – theory, technology, design and case study – held by Zumtobel Lighting in Dornbirn, Austria. The showroom exhibits the newest lighting technologies, including the fast changes of LED lamps (Fig. 1), doubled by the newest control systems, so that everyone can command the settings with a table or a smartphone. Combining these technologies, we can change the atmosphere of a room, both in intensity, but also in terms of colors of light. It is important for architects and interior designers to learn and to experience these possibilities for integrating in their projects.

Fig. 1 - Zumtobel Showroom - Same Space, Different Colors of Light

The case study was about a famous architectural experiment – 2226, in Lustenau, Austria, architects BE Baumschlager Eberle (Fig. 2). The name refers to the worldwide accepted comfort temperatures of 22 to 26 degrees Celsius. The concept for this office block was: “Less energy with less technology and lower construction costs” [1].

Fig. 2 - 2226, Architects BE Baumschlager Eberle

The five-storey building accommodates the architectural studio BE Baumschlager Eberle as well as other offices, a cafeteria and two art galleries. For this revolutionary architectural project, Zumtobel has developed a tailor-made lighting concept that meets the architect's high demands in terms of design and efficiency [2]. It is one of the best examples for integration of lighting design in the architectural concept.

In December, the art gallery has housed the artworks of Keith Sonnier, a representative light artist of Post Minimal Art of the 60s, who introduced new materials in contemporary sculpture: neon, glass, synthetic materials [3].

Fig. 3 - 2226 - Light Art - Keith Sonnier Installation

The workshop was very useful for us as architects and lighting educators, by offering information about the trend in lighting technology, focusing on LED characteristics - light quality, long lifetime, luminaire flexibility and design, energy efficiency. The architecture and lighting concept of 2226 and the art light perfectly matched with what we are teaching...

## 2 TEACHING LIGHTING DESIGN

The study of lighting design in the Faculty of Interior Architecture covers three specific issues: theory, design and practical application (workshop), highlighting the importance of each stage, and the correlation between them. At the end of the lighting design courses and projects, and after experiencing light effects, the students should be able to propose a lighting system in terms of quantity and quality of artificial light, using the most innovative concepts and technologies at the time.

### 2.1 Theory

The lighting design courses in Interior Architecture Faculty cover two semesters. The first course – Interior Lighting - starts in the 8$^{th}$ semester and consists of theory, technology and case studies. The specialized terminology is very important for the further collaboration with all the designers involved in a project – architects, electrical engineers, lighting designers etc. Understanding physical phenomena will help the interior designers to play with light effects on different forms, textures and colours. They also learn that there is no contradiction between high quality light and energy efficiency, two important concepts in sustainable lighting design. In the 9$^{th}$ semester, Arch. PhD. Raluca Buzdugan teaches Artistic Lighting, including the psychological aspects of light, but also about lighting design as an artistic approach.

### 2.2 Lighting Design Studio

In the 9$^{th}$ semester, in parallel with the Artistic Lighting course, students work in teams on a project with two major components: a proposal for the lighting system of a temporary art gallery and an artistic installation.

#### *2.2.1 Lighting for Art*

The design brief describes a space for temporary art gallery, where light is very important. The main requirement is the flexibility of the artificial lighting system, able to cover more layouts and to highlight different exhibits: paintings, sculptures, photography, 3D models. The research phase includes some other specific lighting features for artworks: lamps for sensitive art protection, colour rendering, light colour characteristics, but also energy efficiency. At this point, it is important to be informed about the latest innovation in lighting technology, including lamps, luminaires, control systems, and design too. The students prepare sketches, CAD drawings and specifications, all the architectural information enough for others (teachers, lighting designers, clients) to understand the lighting design proposal.

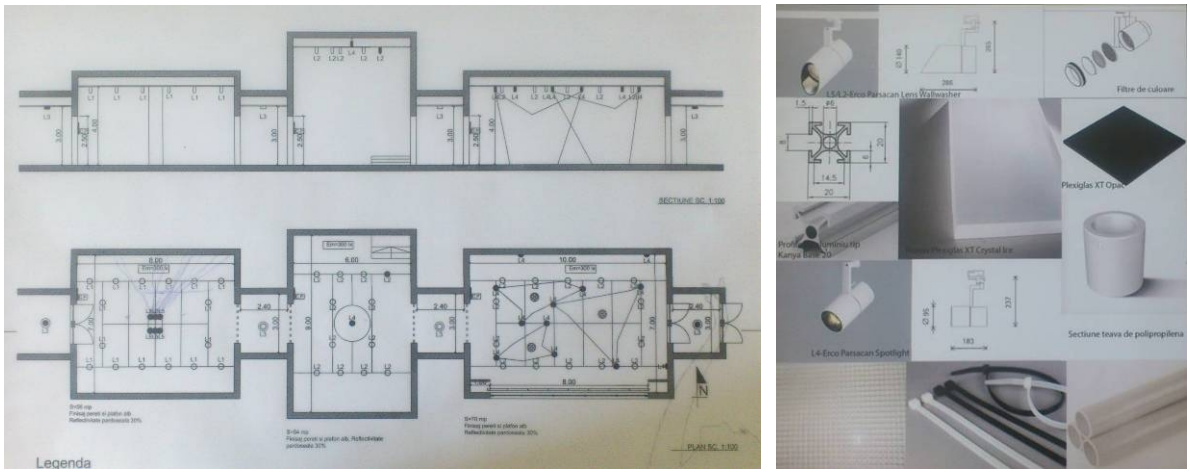


Fig. 4 - Art Gallery Lighting Design – Project

### *2.2.2 Light Art – Shadow Art*

The second part is an artistic installation, in which students should tell a story on different themes, using different techniques and playing with light and shadows. As with any project, there is a first step of documentation, in which students meet some artists of light: Dan Flavin, James Turrell, Olafur Eliason, Keith Sonnier. The school project is not about high technology, is more about playing with the light effects: shadows, reflexions, or translucency. For this part of the project, students learn more about the techniques used by other artists: Fabrizio Cornelli, Rashid Alakbarov, Kumi Yamashita. One of the most popular examples is Kumi Yamashita, who uses simple materials and objects that cast surprising silhouettes when lit from the right angle: an exclamation point becomes a question mark, paper squares become human profiles, a piece of wood on wall creates the image of a child sitting on a chair (Fig. 5).

Fig. 5 - Chair - Kumi Yamashita, 2010

After the research, in the same space as the first project, students conceive a story in several scenes, using light effects. One of the most popular Romanian fairy tales is about the fairies

called “iele” – supernatural creatures with great seduction force, renowned for their magic night time naked dance (Fig. 6 and Fig. 7). This second project consists of an essay, sketches with light effects, CAD drawings, architectural and lighting details.

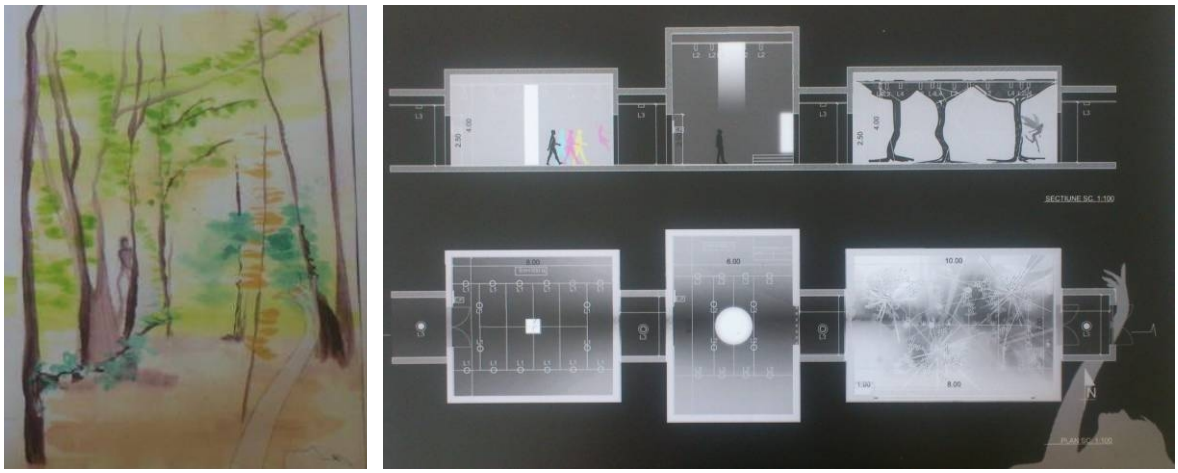

Fig. 6 - Light Art - Romanian Fairies - Project

Fig. 7 - Romanian Fairies – Project

## 2.3 Experiment as learning tool - the workshop

Part of the artistic installation is subject for the one day workshop, after projects delivery. Of course, this is the most fun part of the lighting study. In the Lighting Laboratory and all over in the University, the students play with light effects: anamorphic or color shadows (Fig. 8), reflection or translucency, static or dynamic effects.

Fig. 8 - Romanian Fairies - Workshop - Anamorphic and Color Shadows

Very useful is the possibility to verify the relation between the project and the reality during the workshop, and also to return and to modify the second part of the project after the experiment with light and shadows.

Very important is the teamwork too, trying to improve the cooperation and communication between the students, to reach a common goal – for the time being a high grade.

For our students, these courses, projects and the workshop are an introduction to the subject of architectural and artistic lighting. They learn how to design and to manipulate light – an important tool for an interior designer or an artist. The next step was to participate at the lighting design contest „Do You Light?" organized for architecture students by Zumtobel Lighting Romania, where the first three price winners are students from Interior Architecture Faculty and Design Faculty.

## 3 CONCLUSIONS

As architecture and interior design, lighting design is both an art, and a science. It is a subject that is often clouded by technical terms, complex physics and mathematics [4]. We can measure the quantity of light, but its quality is a unique experience for every each of us. With the new LED technologies and the latest control systems, architectural lighting is more and more creative, integrating light on different levels and giving the option to change the mood of a space. Architects, interior designers, artists should be more involved and updated in this area. Maybe our students, next interior designer generation, will give more importance to the light in their activity, following and experiencing the innovations in lighting technology.

This year we celebrate the International Year of Light and Light-Based Technologies 2015 (IYL 2015), an initiative with hundreds of events that will highlight the importance of light in our lives, with solutions in different areas: energy, education, agriculture and health [5]. The first official event was the Opening Ceremony, held at UNESCO Headquarter in Paris (19-20 January). This was the beginning of a year-long series of activities all over the world, with a special session in Sibiu (8-12 September): international congress, outdoor performances, exhibitions, public workshops [6].


Fig. 9 - IYL 2015 - Logo

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# TWO PROJECTS, TWO TEAMS, TWO HOUSES: PRISPA AND EFdeN AT SOLAR DECATHLON EUROPE

**Assoc.Prof.Dr. Dorina Onescu-Tărbujaru, Int.Arch. Lucia Leca, Int.Arch.Stud Ana-Maria Din**

*"Ion Mincu" University of Architecture and Urbanism, Bucharest (ROMANIA)*
*PRISPA (Romania)*
*EFdeN (Romania)*
*dorina_ot@yahoo.com, lecalucia@gmail.com, 13maria.din@gmail.com*

The academia evolves, pushing performance limits increasingly above, especially through international contests. One of the statements for the architecture students consists in how should the projects be during study years: resembling the real life projects, preparing them for the future practice, or exceptional and unique projects, unlikely to encounter in the real world, although imagination empowering. The academic background, starting from imagination to real project, shows that performance is achieved when working in teams and mixing experience with youth. The university's initiatives will produce a change for future professionals.

This is the context of the developed theme, aiming to study two projects: PRISPA and EFdeN. Both represented Romania at the international competition of solar houses and embedded technologies, Solar Decathlon Europe (SDE). The contest addresses schools of various fields (architecture, engineering, machine building, art, management, marketing and communication, etc.), integrating the projects into the academic curriculum. SDE is a prestigious competition, with almost two-year development per edition. The two European editions of the competition have developed different strategies to approach the projects. Almost all the teams of SDE 2012, Madrid edition, presented solar prototypes for rural architecture. PRISPA is a viable solution for the Romanian rural revival, regarding the village's landscape, houses and community. The solar prototype abides by the principles of the traditional architecture, through the carpentry construction method and the presence of the inertia thermal space: prispa, vestibule and northern thermal buffer (storage and technical core). On the other hand, the SDE 2014 edition, Versailles, established rules solving urban architecture problems. The EFdeN project proposes densification of brownfield sites in Bucharest, through residential complex built by variations of the EFdeN prototype. The focus of the pilot project is based on the nature integration in habitat with an energy efficient greenhouse. The two projects were built in Romania and transported to the competition site. Their stages of development were sequentially added as layers in the two year's process, which led not only to integrate research into the solar prototype, but also to identify the constructive solutions through practice. PRISPA and EFdeN offered a hands-on learning method for an integrated design-build process.

The paper explains the change of a set of values in architecture for students, bringing in the spotlight the innovation in sustainable design. For the students involved in the two teams, the participation at SDE competition represents the first real project, a project of integrated research in construction. They learned multidisciplinary under the guidance of teachers and applied technologies under the market and industry professional's supervision. PRISPA and EFdeN enriched the knowledge about the potential of an initiative, a project whose value increased after the teams and the solar houses returned to Romania from Madrid and Versailles. PRISPA has achieved in September 2012 second place at the *Energy Efficiency*

contest, second place at the *Public Option*, fourth place at the *Electrical Energy Balance* contest and *Honourable mention for social awareness in solar system integration*. EFdeN returned from Versailles in July 2014, with *Honourable mention for sustainability*. The paper will present the PRISPA's and EFdeN's endeavour for obtaining the mentioned results.

The route between the call for application and the competition is sustainable through: the innovative methods of integration the materials and equipment, time management for transport and efficient assembly and disassembly of the solar prototype, financial investment obtained from project and returned into project, interdisciplinarity, volunteering, awareness for solar energy and sustainability. Students participating at a SDE competition achieve knowledge through challenges to research and experiment. This knowledge represents the background for the students' career, for futures professionals who will be responsible for the build environment. Being SDE's competitors, PRISPA and EFdeN are viable and tested projects for the Romanian market, by answering to sustainability and innovation, and an example for practice oriented educational projects.

**Keywords**: Integrated research, innovation, solar house contest, interdisciplinarity, design and build project

# 1 RETROSPECTIVE OF THE INTERNATIONAL COMPETITION SOLAR DECATHLON EUROPE

Solar Decathlon is the most important international competition for architecture and integrated solar technologies addressed to students all over the world. Its history begins in 2002 in America, through an initiative of the US Department of Energy. Up to now, 5 editions were organized in United States of America (in 2002-2005, 2007, 2009, 2011 and 2013), 3 editions in Europe (in 2010, 2012 and 2014), and one edition in Asia (in 2013).

## 1.1 Importance

The contest challenges universities around the world to research, design and build the prototypes of solar houses over a period of 18 months. The relevance of the competition is highlighted by an attempt to raise the research level of the solar technologies in architecture, to encourage multidisciplinary university collaboration, to educate the general public through the variety of solar prototypes, and the access to the technologies application techniques by a variety of professionals. The competition involves assembling a solar prototype within 10 days and its evaluation throughout 10 contests, 7 of which are evaluated by a jury committee, while the other 3 are monitored by sensors.

## 1.2 Solar Decathlon Europe

Solar Decathlon Europe (SDE) Competition requirements may change, aiming towards solving certain aspects in the strategies of the European directives. The emphasis is on finding the balance between its 10 contests. The 'Industrialisation and market viability' contest of the first two European editions was replaced by the 'Urban Design, Transportation and Accessibility' contest (Fig. 1).

| SDE contest, 2014 edition, Versailles | SDE contest, 2010 and 2012 editions, Madrid | Score | Evaluation |
|---|---|---|---|
| Architecture | Architecture | 120 points | Jury |
| Engineering and Construction | Engineering and Construction | 80 points | Jury |
| Energy Efficiency | Energy Efficiency | 80 points | Jury |
| Electrical Energy Balance | Electrical Energy Balance | 120 points | Monitoring |
| Comfort Conditions | Comfort Conditions | 120 points | Monitoring |
| House Functioning | House Functioning | 120 points | Monitoring |
| Communication and social awareness | Communication and social awareness | 80 points | Jury |
| Urban Design, Transportation and Accessibility | Industrialization and market viability | 80 points | Jury |
| Innovation | Innovation | 80 points | Jury |
| Sustainability | Sustainability | 100 points | Jury |

Fig. 1. 10 SDE contests

In the 2010 and 2012 SDE editions, both of which were organized in Madrid, the strategy addressed mainly 'rurban lofts' [1] and rural housing, and the teams responded with a fitting solar prototype to their particular local context. The requirements of the Versailles SDE 2014 competition were more focused on the urban areas. The teams had to focus their attention on mobility and density in big cities and on affordability and sobriety, regarding to ensure a renewable energy supply and to limit demand.

# 2 ROMANIA AT SOLAR DECATHLON EUROPE

The participation at SDE represents a boost for the educational, the companies of the building sector, as well as for the general public, bringing valuable insight on new possibilities of easy and accessible integration of solar systems. It is noticeable that only two countries from the south-eastern Europe competed in the three editions: Romania and Hungary.

Based on the solar prototype strategy, the country's socio-economic and cultural context, and the entities that the teams successfully managed to bring together to collaborate, every project participating in such contests gets to have a different path between the period defined by the application and competition. Regarding the educational system and the argumentation of Kiel Moe about what an university would need, the participating teams from Romania claim to become a first model of design-build programs in school of architecture, which combines "academic research and instruction-through-construction experience to build affordable housing" [2].

## 2.1 PRISPA

PRISPA was the first team that placed Romania on the SDE map (Fig. 2 – left side) and created a precedent for the Romanian universities. For the Versailles SDE 2014, four teams applied from different university centers: Bucharest, Timișoara, Cluj and Iași. EFdeN is the team from Bucharest that participated at the last European edition (Fig. 2- right side), while upTim from Timișoara qualified as a reserve team.

Fig. 2 PRISPA – SDE 2012 (left side), EFdeN – SDE 2014 (right side)

### *2.1.1 PRISPA local strategy*

PRISPA addresses the Romanian village and believes in the consciousness of its specific. The vernacular architecture has thrived from the birth of the Romanian villages and has maintained its vigor until the middle of the twentieth century. Nowadays, the cultural landscape changed and lost its quality along with the new constructions. The village functions on the principle 'house bigger than the neighbor's', with the desire of having the urban comfort. An opulence need is present and it comes from the returning of two types of population classes. The first one is represented by the people wearied by the vibration of the city, resulted from the information's influx due to the rapid evolution of technology and science [3]. The second one returns on the native heath, determining major transformations in the rural areas due to mass emigrations. The solar prototype is a sustainable solution for reviving the Romanian village. PRISPA is a model that 'explores the interaction between several concepts: the Romanian traditional architecture, quality of the indoor environment, innovative energy solutions and the housing standards defined by the year 2020, offering a viable solution for an energy efficient house in regions that enjoy sunshine during the year, with hot summers and cold winters, where heating and ventilation are major energy consumers.' [4].

### *2.1.2 Results*

With this local context, PRISPA competed with 17 other teams. The biggest investment in a solar prototype from the competition was 2 million euro. The Romanian prototype was assessed at 120.000 euro. The PRSIPA strategy was to compete with a low-budget prototype in an international context, but financially accessible for Romania. PRISPA answered to the competition requirements with an intelligent association of equipment with accessible maintenance and with local materials, enhancing their properties. The awards received are: 2nd place at Energy Efficiency, 2nd place in the Public Choice, Honorable Mention for 'Social awareness in solar system integration', and 4th place at Electrical Energy Balance.

### *2.1.3 The architecture is the strategy's answer*

For the SDE juries, the winner of the Architecture contest is the prototype that clever integrates the solar technologies and that gives a viable answer to the needs exposed into the project strategy.

PRISPA has an 'architecture opened to the humbly scale of human' [5] and corresponds to the corrugated infinite horizon [6], understood as the specific Romanian spiritual space. Directly related to the bio-climatic principles, PRISPA naturally integrates in the 'mioritic' spatial symbol, referring to the open and high plane of the green mountain ridge (Fig. 3).

Fig. 3 PRISPA House, Luncani village, Bacău county, March 2013

The volume conformation of the solar prototype keeps only the thermal inertia spaces from the vernacular architecture (prispa, the vestibule, the northern storage), as the answer for the continuous adaptation of the traditional house at the local climate. From centuries, prispa, the Romanian traditional porch, is an element that people are permanently reporting as a socio-cultural element from national identity: 'a house without prispa is a house without soul' [7]. Through its simple way of conception, prispa fulfills multiple purposes: it is a transition space between private and public enables social activities, protects the interior space form direct sun heat during summer and from wind, rain and snow during winter.

### *2.1.4 Energy efficiency*

Through integrated design [8], PRISPA became a successful experiment, an energy efficient house recognized by the 2nd place received at this contest. Energy efficiency is the result of integrating active systems – solar surface defined by PVs and solar panels, HVAC – in balance with the passive systems of the envelope – glazing, thermal buffers and thermal masses. PRISPA defined the house envelope as a dynamic entity, an articulated mechanism that selects captures and channels different forms of energy for the building life, finding the perfect balance for high performance of the equipment, for a low CO2 impact, for maintenance and minimum investment.

The 32 mono-crystalline PVs, with an installed power of 8kW, are mounted at 20° roof slope, on two rows, with serial connection and with 10cm high between the zinc sheets (last layer of the roof) and the PVs, assuring a temperature that offers the maximum efficiency of the equipment. The 4 sqm surface of the solar panels heat more than 200 liters of water. The countercurrent air-to-air heat exchanger has a major contribution to energy efficiency. The equipment recovers the heat of the air extracted through ventilation grill from the kitchen and bathroom. The recovered heat is release through convection to the fresh air, inserted into living room and study. The heating is achieved by using an air-to-air heat pump with a double-split system with invertor. The system functions form a theoretical point of view, down to -15°C. When the temperature is lower than -15°C, a series of infrared radiant panels are used. The radiant panels are strategically placed relative to the thermal mass and create a uniform thermal radiation field, canceling the cold radiation effect of the glazing. The cooling process is

achieved using the same air-to-air heat pump, with a reversible cycle. The passive elements efficiently cooperate with the active systems (Fig. 4).

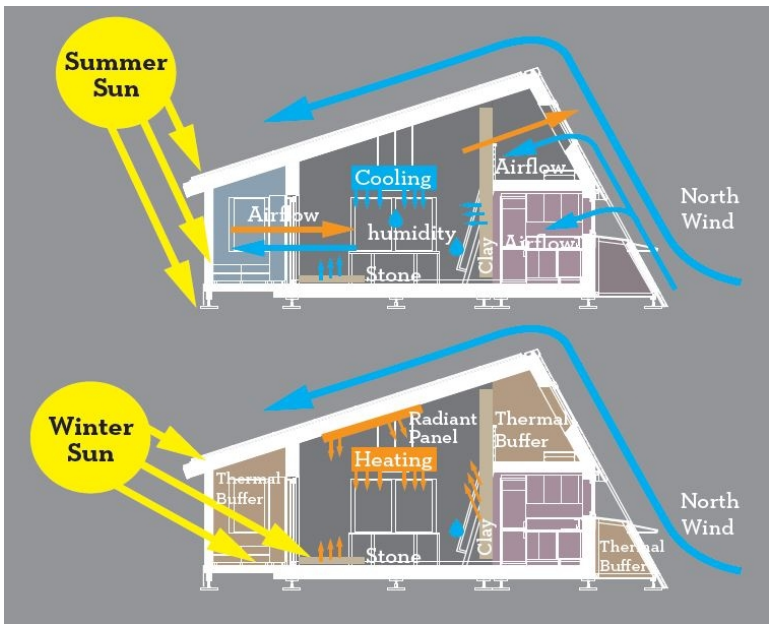


Fig. 4 Active and passive strategy

Each element of the envelope was tested through experiment and redesign, when cases, with optimization in mind: the placing of structural elements at 62,5cm (characteristic for OSB boards), the using of I-Joist instead massive wood (in order to reduce energy loses and avoiding thermal bridges). The andesite floor strip, along the southern glazing of the prispa, has 1m width, 5cm thickness, and the purpose of retaining energy depending on the season. The 14 sqm clay finishing, with 3 cm thickness, holds thermal energy and has the properties of a hydro-regulator material, gathering humidity during periods with excess air-moisture, and releasing it when the air-moisture has low values. Worth mentioning is the following phenomena: an adiabatic cooling results at the surface level of the clay layer when humidity is released, decreasing the interior temperature of the habitat. The thermal masses help to maintain the temperature for 6 more hours after the cooling or heating equipment stop (air conditioning units and radiant panels). The clay has a thermal retention of 1kJ/kg K, and the andesite has 0.92 kJ/kg K. The difference between the simulated load with thermal mass and the simulated load without thermal mass for the living area reach 20.3%. From the measurements during Madrid contest, the interior temperature has not overpassed 28°C, although the exterior temperature reached 400C and 24 persons were simultaneously inside the solar prototype per visiting tour. The north and south glazing contributes to the passive ventilation.

The PRISPA project, by winning the 2nd prize for Energy Efficiency (Fig. 5), answers to a clear statement: the present contains a variety of active and passive solutions of which we can orchestrate a safe and energy efficiency future.


Fig. 5 Energy Efficiency Awards – PRISPA Team

## 2.2 EFdeN

EFdeN is the team that continued this adventure to SDE 2014 which took place in Versailles. The new team managed to train more voluntaries than PRISPA: about 70 Romanian students from the three partner universities: 'Ion Mincu' University of Architecture and Urbanism, Technical University of Civil Engineering Bucharest and Polytechnic University of Bucharest.

### *2.2.1 Local strategy*

In order to respond to the Bucharest's urban sprawl, the EfdeN team's main strategy was to identify the fractures in the urban fabric, resulted from industrial decline, and to use them to create a new face of the city, a more liveable and walkable place for its citizens. The project has the ambition to create a paradigm shift to 'Zero Brownfields' [9], where these ex-industrial sites become areas of opportunity that deliver useful services for society. Therefore, the development of these brownfields sustains the secondary poles of the city's polycentric structure.

In terms of micro – development of the brownfield site, the main direction is to reach the in-fill development by building semi-collective housing (Fig. 6) of maximum 5 storeys with attached greenhouses and spaces dedicated to the urban-farming concept. By bringing nature into the middle of the town, the neighbourhood becomes a destination, instead of only being a transit area, thus making the whole structure to boost both economically and socially as a mixed functional area.


Fig. 6 Urban proposal

The mobility concept is an important instrument for community organization, based on restoring the community spirit, achieving a friendly environment and a lively atmosphere by the mild flows passing through the neighbourhood. From spending the spare time in urban farming areas to going to work, the main forms of movements are by walking or cycling, as the major facilities are placed in the mixed core of the district. EFdeN team vision involves sustainable development of housing, a biophilic Bucharest, which will recover the identity of a city-garden, as it was called a century ago. Therefore, the project speaks not only of a housing development, but also a mobility strategy.

### *2.2.2 Architecture*

The EFdeN prototype is a P+1 house, characterized by minimalist architecture and composed of primary volumes expressing the interior partition.

The greenhouse is the main element that provides psychological and physical comfort to the home. It has multiple meanings and it is used as a thermal buffer during the winter and as a space for urban farming in summer. Moreover, the greenhouse majorly contributes to the house lighting, introducing an indirect light source, complementary to direct lighting. Used as a divider between the different areas of the house, the greenhouse improves the perception of a continuous interior space. The configuration plan captures the idea of integrating the nature into the home and directs all the areas to get to this connection between man and nature.

### *2.2.3 Result*

Sustainability is a social challenge that entails urban planning and transport, local and individual lifestyles, ethical consumerism, green technologies, renewable energy and adjustments in individual lifestyles that conserve

natural resources. EFdeN meets the needs of the present without compromising the ability of future generations to meet their own needs and create a house entirely dedicated to the concept of sustainability.

In order to achieve sustainability, EFdeN adopted the urban farming concept. This activity will determine a more economic, environmental and social aware habitat and it also changes the mentality on productivity and consumption. Sustainability is also achieved by adopting the concept of reducing large distance mobility for different day by day needs.

All the materials and equipment used in the construction of the prototype are carefully selected not to harm the environment. They are either recyclable, have a low grade of volatile organic compounds or are recycled. The fact that it is a construction that can be disassembled, gives the opportunity to reuse building components as well. From the End of Life scenarios, for a lifespan of 50 years, EFdeN can conclude that 90% of materials are reused or sent to different recycling centers (metal-steel, aluminium; glass; wood – OSB; ceramics, cement, stone, gypsum board, cardboard, paper, plumbing fixtures, electrical fixtures).

For all its action in sustainability development, the team received The Honourable Mention in Solar Decathlon Europe 2014 Sustainability Competition (Fig. 7).

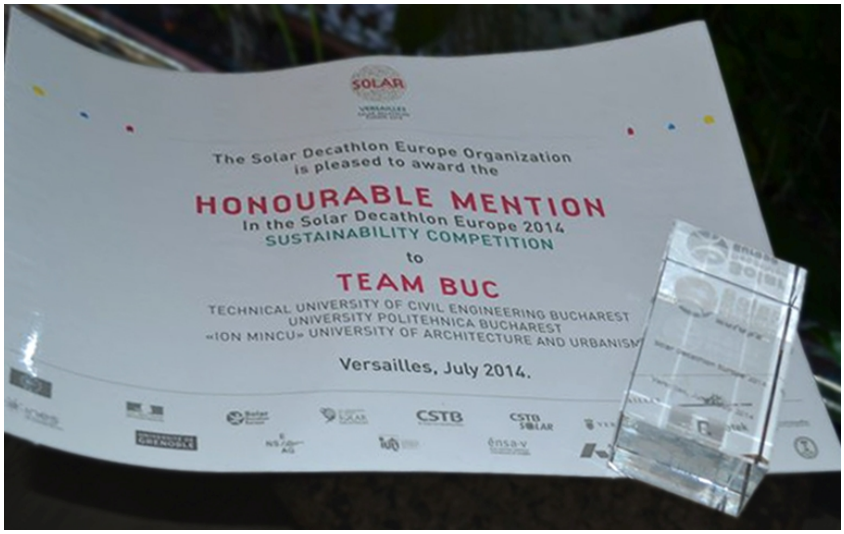


Fig. 7. Honourable Mention in Sustainability Competition – EfdeN

# 3 THE FIRST STEP TO MATURATION

## 3.1 „A hundred-mile journey begins with the first step”

The participation in SDE competition was the first real project of the student volunteers. The Romanian solar prototypes were built in the parking lot of DIY stores where students have tested their own projects through practice, allowed their beginner's mistakes and were closer to the potential clients. The majority of the debates about strategy took place on the construction site. The questions that came from the public were the most challenging and generated ideas for other intelligent solutions. The impact with the general public has contributed greatly to the psychological education for competition and for the future of each individual labour market.

The roadmap of a SDE’s project involves clearly defined stages. The student’s education is theoretical for about a year, beginning with the acceptance of the application by the SDE organizers. The experiment as learning tool extrapolate from the university area to other fields: multidisciplinary workshops and practice methods of the professionals form the Romanian market. The roadway from the strategy to the architectural expression, from the comparative design studies of all the fields to the material’s choice based on technical sheets, from the volunteers recruiting to the social awareness of the project, involves multidisciplinary interaction.

The experiment as design base consist of comparative solution’s studies, meaning the integration of the information assimilated from the multidisciplinary contact. These theoretical studies continuously evolve through new materials and technologies, depending of the strategy context and the requirements clearly defined in the contest manual, Building Rules and Regulations.

The construction site ran for six months. This stage represents the team's exercise that builds the solar prototype applying the design project and the knowledge accumulated during university years. The team continues the experiment stage by testing and finding solutions for problems with the aim of obtaining the best results. For the student of architecture is a race against the clock of a beginner into a high competitive sport. Now the team is ready to go to the SDE competition. The team transforms and gets the high level of efficiency with the aim of assembling the solar prototype during 10 days. The atmosphere from the construction site binds with the change of information and experience with the other teams. Getting the house done, before the construction deadline, means the first prize for each team. After nearly 2 years of training and 12 days of marathon, the few minutes of 'pure joy' are reflected in the first and most hard-earned 5 points out of 1000.

This is the end for theoretical and practical experiment and the start of the competition!

### 3.2 Solar Decathlon Europe – a public exhibition for realized experiments

By contrast with the school of the industrial age, the future will bring in foreground new school's revolutions. The SDE competition is pushing performance limits increasingly above through the public exhibition of the solar prototypes, projects that started from imagination and became real through teams that mix youth with experience. This type of university's initiative produces a change for the future professionals.

As Alvin Toffler says in his book, 'The future shock', people will answer more and more to the intellectual thinking and creative work, while the technology will effectuate the routine work. As a general conclusion about the visitors of the solar prototypes, this is a valid affirmation. The general public came to see an exhibition of 1:1 scale solar houses, interested in specific atmospheres of the houses and in the integrated technology that can save more their money and time. This experiment is the test for the market viability and industrialization in the international context. For increasing the social awareness and the general level of the consecutive editions of SDE, the organizers published on-line the documentation of the build solar prototypes as an open source document.

### 3.3 Added value of the Romanian projects after returning from competition

The proof for a successfully architectural experiment is the project implementation accordingly to its strategy. After the competition, PRISPA achieved its most important goal: today the house is a home in a village, Bacău county. SDE competition was the cause for the PRISPA project that further became an example. Nowadays, the general public use parts of the PRISPA's principles: energy efficiency envelope, modulated structure for reducing material, local materials usage etc. PRISPA house was recognized by the Romanian standards with Class A+ Energy Efficiency Performance Certificate and forced the alignment with European standards, being the first house with photovoltaic cells that can inject the produced energy in the national electricity grid. Moreover, it raises the level of energy performance in the building sector. Related to this is the EvoHouse, the first house in Romania with Passive House Certificate granted by the Darmstadt Institute, achieved with the collaboration of a PRISPA member.

EFdeN will be the first Research Center of Comfort Conditions and the first home sustainable certified with 'Living Building Challenge'. The EFdeN prototype will be exhibited and presented to the public, will host testing teams and integrated monitoring equipment.

## 4 INVOLVMENT OF THE UNIVERSITIES IN THE TWO PROJECTS

### 4.1 The integration of the Solar Decathlon Europe competition into the curriculum

For the successful outcome of the competition, certain criteria had to be fulfilled from the very beginning, as the jury had to assess the teams accordingly. These quality merit criteria are based on performance and enable the jury to make a selection from the tenders with the highest quality merits. The assessment criteria established by the SDE Organization are: 25% technical innovation and design, 25% fundraising and teamwork, 25% integration into the faculty curriculum and special considerations, 25% project organization and planning.

The SDE competition was integrated into the faculty curriculum under the 'Multifunctional solar house' project, starting from 2010 at the Interior Architecture Faculty. The suggested theme was set to analyze the concept of 'solar architecture', to understand the interaction between the natural and the built environment, getting the students familiar with various renewable energy technologies, power saving and rational service of the resources. The integrated project has two stages: the architectural concept, including the 'one day project', and the interior

design concept. The study continued with a specialized project – landscape planning – based on the solutions defined in the previous stages.

## 4.2 Diplomas

The SDE project became the theme for three diplomas of the following students: Lucia Leca – Interior Architecture Faculty, 'Ion Mincu' University of Architecture and Urbanism (UAUIM), Timu Octavian, Șoflete Marius, Cătălin Caraza – Faculty of Civil, Industrial and Agricultural Building, TUCEB.

Students focus on the research results, on their experience and on the future options of using solar energy. The basic principle was the experimentation, followed by the application of the positive experiences to the construction process and every day building practices. The project for the diplomas was initiated from utopias, seen as important forces that lead to practical development. An eloquent example (Fig. 8) is the design of the solar thermal proofing envelope for a traditional house that preserves the plan, volume, constructive layers of materials and techniques. The sliding envelope allows the increasing or the decreasing of the volume of the heated or cooled air, depending on the season, thereby sufficient amount of energy for everyday house functioning is produced by the integrated solar systems.


Fig. 8 Diploma project, int. arch. stud. Lucia Leca – 2013

## 4.3 Education

Nelson Mandela used to say that education is the most important weapon one can use to change the world. The most important effect of this project was the change it brought at an individual level among students from the participating teams. The passion for finding answers to questions challenged the volunteers to permanently search for the best solution. The research and practice was recognized through university credits for the compatible fields of study. Some students acknowledged the role of a mentor in their evolution. The teacher exceeded his area of expertise and became a mentor through its contribution on training a future professional, offering more than technical advices regarding the project solutions implemented under the guidance of the Romanian market professionals.

## 5 THE DIRECTION OF SOLAR DECATHLON COMPETITON

The SD Competition may be regarded as an 'attractor' [10]. An attractor represents a point or an axis, in a dynamic system which consists of subsets in a limit that gravitates on different trajectories. We consider these subsets the participating teams, with no other constraints but to gravitate around the attractor. The trajectory is the strategy that generates dissipation towards the larger public and construction companies, offering alternative solutions for solar houses on the consumers market.

Solar Decathlon joins the governments that generate the roadmap for energy efficiency. The 2014 SDE edition, Versailles, became a platform for the companies concerned with sustainable energy housing and offered a vision for the future of Europe. 'This event will allow the European Commission to put into perspective the framework for 2030: to combine its objectives in the fight against climate change and the need to meet these objectives at a reasonable cost.' [11] In addition to solar technology development, competitions bring into focus the energy future of construction: low $CO_2$ footprint, zero-energy houses, energy storage.

Nowadays, the Solar Decathlon competition develops on three continents and constantly attracts more and more general public. Looking forward for the diversity of the applied studies-case competing in the next SDE editions in America, Europa and Asia!

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# INTELLIGENT GLASS FAÇADE

**Assistent Professor PhD Architect Oana Doina Truşcă**

*Faculty of Architecture, University of Architecture and Urbanism "Ion Mincu" (ROMANIA)*

*otrusca@yahoo.com*

## Abstract

Nowadays, the international trend in the field of sustainable architecture is to create intelligent envelopes able to provide a low, no regenerating energy consumption for the buildings. In this context, the façade described in the current article, aims to achieve energy efficient glass envelope able to control the interior environment of the edifice.

The article presents the author's personal proposal for an intelligent system, made of metallic elements, able to develop complex functions and which can be attached to various types of glass envelopes in order to decrease the energy consumption used to provide thermal comfort for the users of the building. This article also presents the results of an experimental research featuring the composition and the way in which the façade works.

The glass envelope, colonized by the proposed metallic elements will act as an intelligent interface between the exterior and the interior of the building. This interface is able to adapt to the dynamics of the climate in order to provide a healthy and comfortable environment for the occupants of the edifice. The metallic tubes will define the appearance of the building creating an iconic image of the edifice (Fig.1).

**Keywords**: intelligent façade, sustainable architecture, energy autonomy, adaptive envelope, specialized interface.

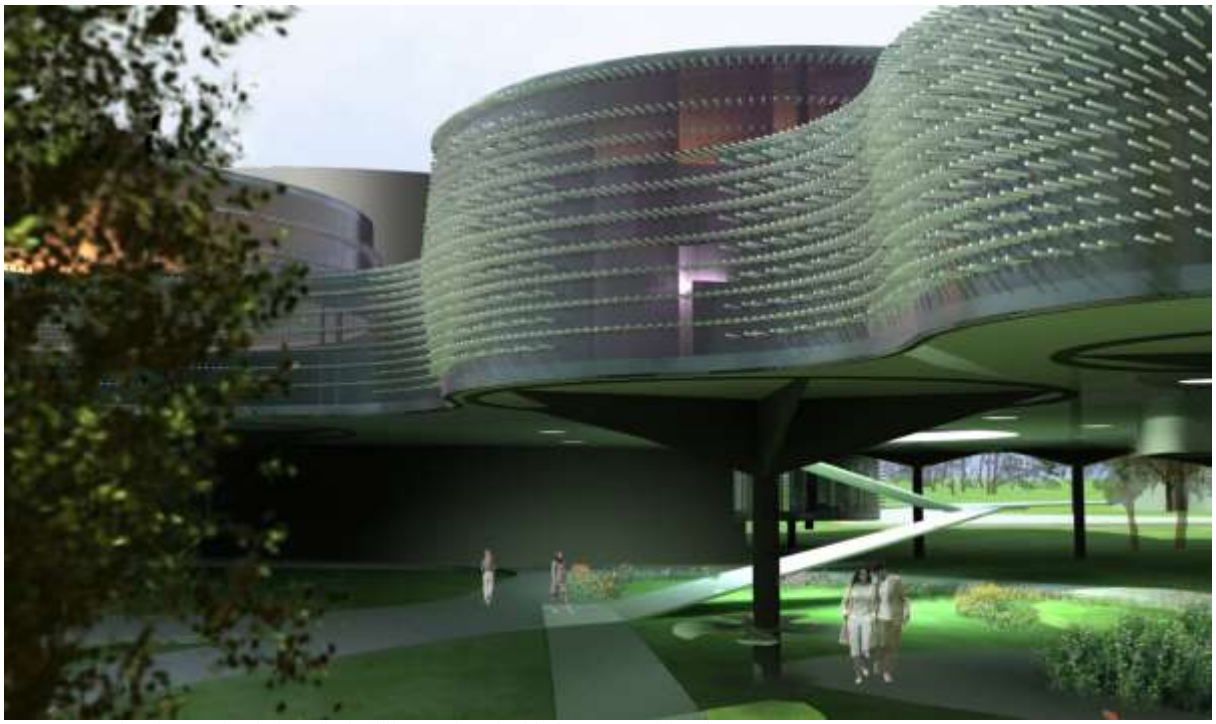


Fig. 1 - Day time image simulation of a building equipped with the proposed façade. (Image source: author)

The nowadays envelope loses its monofunctional character of an enclosure system only to become a complex system that reacts to climate change and to people's needs.

The originality of the proposed enclosure system is the development of an envelope that can adapt to the users' requirements and environmental conditions. This envelope acts as an active and interactive epidermis that exchanges information and matter with the exterior. The intelligent glass façade is physically able to react to climate change in order to improve the energy performance of the building and the thermal comfort of its internal space.

# 1 INTELLIGENT FAÇADES

The word *intelligent* in association with façades stresses their ability to respond to the dynamics of climate conditions in order to reduce primary energy consumption used for: heating, cooling and natural lighting.

The importance of using intelligent envelopes in the composition of architectural objects has been reported since 1996 in a conference in Berlin – "The building envelope permeability to light, heat, air with its transparency must be controllable and capable of modification in order to react to the climatic variations of the site"[2].

The described envelope is a dynamic membrane, active, flexible, sensitive, adaptable to material exchange (most often air) that occurs between the inside and the outside of the edifice.

# 2 DESCRIPTION OF THE PROPOSED ENVELOPE AND THE GOALS OF THE INTELLIGENT METALLIC TUBES

The set of intelligent elements proposed by the author and meant to be used in different glass façades is composed of intelligent metallic tubes with complex functions.

This assembly, proposed for use in various types of glass façades, is made of intelligent tubes made out of perforated aluminum sheet fixed perpendicularly on the surface of the building envelope (Fig. 2). The system made of metallic tubes was designed to be attached to the curtain glass façades or to the double skin ones. In accordance with the solution elected by the architect, these metallic elements transform the envelope into a specialized interior-exterior interface, aiming to ensure the indoor thermal comfort with a minimum consumption of conventional energy and to provide a new interesting exterior image for the building.

The integration of the metallic intelligent tubes able to develop complex functions in the composition of the glass façade is meant to achieve intelligent envelopes capable of superior performance in relation to the ordinary ones and, at the same time, to provide the building with an attractive appearance.

The size, density and layout of the tubes on the glass façade are determined by: the cardinal orientation of the façades and the climatic conditions of the site where the building is placed, in order to create shaded glass façades during the warm season (the entrance of the solar radiation is blocked in order to avoid the overheating of the building) and to allow the entrance of solar radiation inside the edifice during the cold season (passive heating).

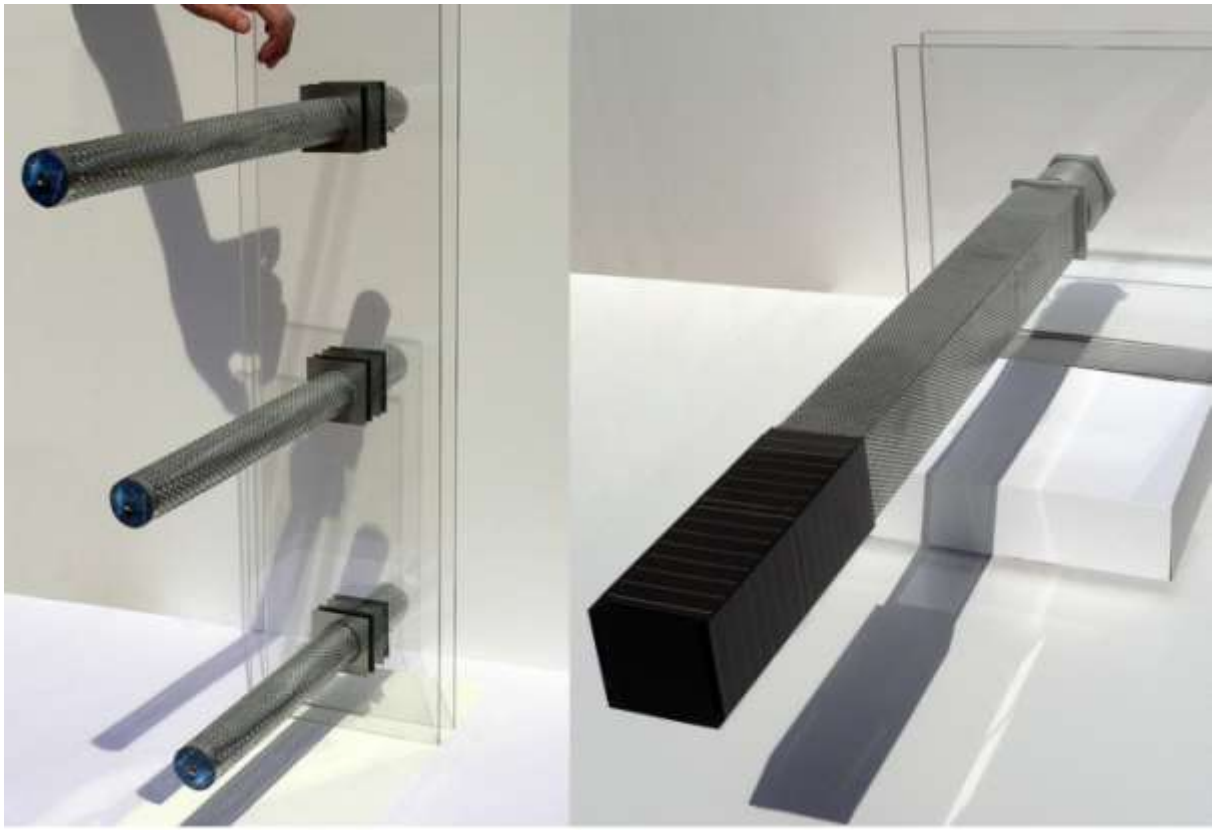


Fig. 2 - Images of the prototype of the façade (scale 1:1); left with round tubes, right with square tubes. (Image source: author)

## 3 THE COMPOSITION OF THE INTELLIGENT METALLIC TUBES AND THE OPERATING MODE OF THE GLASS FAÇADE

Each metallic tube attached to the façade consists of: solar panels, battery, electronic control module, microprocessor, RGB LED, temperature sensor, radio-control receiver, antibacterial filter, micro-server, an ensemble of two diaphragms set in motion by the micro-server in order to allow or to block the air exchange between the interior and the exterior environment.

For the control of the interior environment, the building must be equipped with a centralized control system (a computer connected to a weather station), temperature, humidity and pressure sensors placed in all the regions of the building (a building region concerns all the enclosed spaces, separated between them and with direct contact to the exterior environment). The tubes attached to the glass façade are grouped by regions and the microprocessors of the tubes placed in the same region receive the same code. According to the weather conditions, through the radio receiver and the codes of the tubes, the centralized control system of the building can transmit a signal to the tubes so that they allow or stop the air transfer between the exterior and interior of the building; this is done in order to provide thermal comfort inside the edifice while achieving minimal consumption of conventional energy.

## 4 THE FUNCTIONS OF THE INTELLIGENT METALLIC TUBES

In order to improve the energetical behavior of the building and to offer it an interesting view during both night time and day time, the tubes perform several functions: outdoor artificial lighting, natural ventilation, energy autonomy, solar control system and air filter. These functions are carried out due to the energy captured by the tubes during the day. The goal of the mentioned functions is to significantly decrease the energy consumption of the building in relation to: the exterior lighting of the edifice, the natural ventilation of the indoor space and also the heating and cooling of the interior environment of the edifice through the matter exchange – air – realized to the exterior.

Each metallic tube has an intelligent decision system and it is able to produce and to collect energy in order to achieve the proposed functions.

## 4.1 Exterior artificial lighting

This function is ensured by the capacity of the intelligent metallic tubes to acumulate solar energy during daytime and to transform it in light energy during the night.

For the artificial lighting of the façade, the project aims to provide an energetically autonomous lighting. In order to reduce the energy consumption for the artificial lighting of the façade efficient RGB LEDs were selected. For the colour variation of the anvelope, generated by the RGB LEDs positionated within each tube, the outside temperature was chosen as a parameter. Thus the nocturnal image of the façade is changing according to the temperature of the natural environment. We can consider that the façade changes its colour in the same way the pigment of the leaves in the trees changes throughout the seasons of the year. The colour of the façade is dark blue during cold winters, then becomes pale blue – green in early spring, changes to yellow – orange at the beginning of the summer, in the hottest days it turns to red and throughout autumn goes from pink to purple and indigo tones (Fig. 3).

The novelty and the originality of the function that provides artificial lighting for the envelope consists of designing an energetically autonomous lighting system. This system will ensure an interesting iluminated façade with a zero-energy consumption from the common energy distribution network and, at the same time, it will turn the edifice into a lighted landmark during the night time.

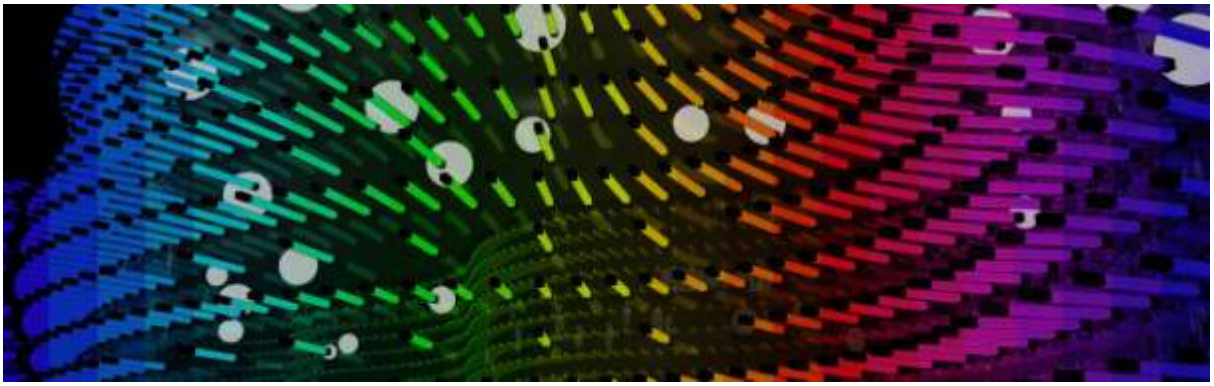


Fig. 3 - Simulated image with changing colours of the façade. (Image source: author)

## 4.2 Energy autonomy of the façade

Each metallic tube was designed as a stand-alone in terms of energy consumption. Thus, for the performance of the façade, each tube is able to produce solar energy using photovoltaic cells placed on its outer extremity and to store this energy in the battery located within the tube.

## 4.3 Natural ventilation and cooling of the building

The façade, through its tubes, ensures natural ventilation and cooling of the interior environment of the edifice. This improves the quality of the interior ambience and provides thermal comfort for the users of the building.

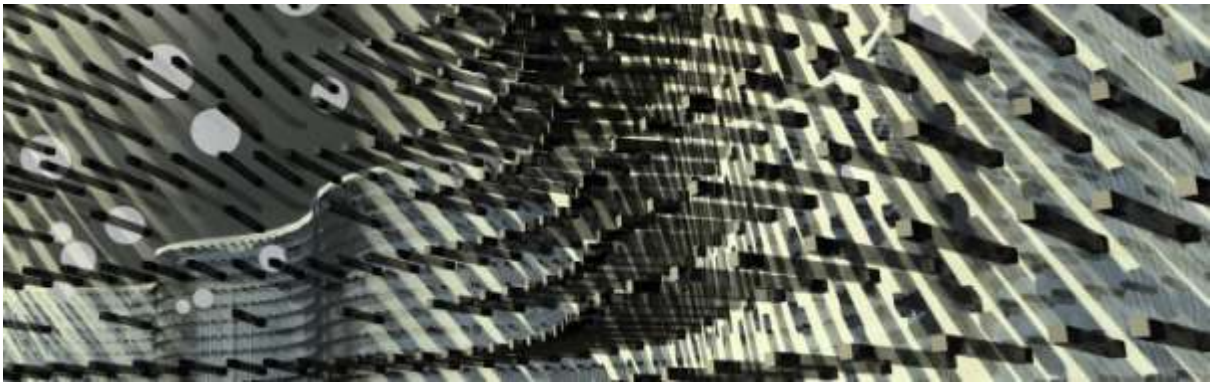
For the two types of natural ventilation - cross and convection – the calculations and the simulations performed showed that a building that uses the proposed intelligent envelope is able to achieve natural efficient ventilation by replacing indoor air with outdoor air.

The originality of the proposed ventilation system consists of the design based on perforated aluminum tubes which can be attached perpendicularly to the surface of the glass, thus obtaining small holes on the entire surface of the glass, designed to provide an optimal natural ventilation of the interior space. The permeability of the façade, in relation to the air flow is provided by the opening of the system composed of two diaphragms which encloses the openings within the tubes. The proposed façade is an efficient control system that operates the closing / opening of the orifices within the tubes in accordance with the interior and exterior temperatures in order to provide thermal comfort to the people inside the building.

Just as a plant breathes and swets through its leaves, the envelope operates in the same way by ensuring ventilating through its tubular intelligent elements that act like pores.

### Solar control of the façade

Another important function performed by the façade is to provide shade on the surface of the glass through a solar control system made of the same metallic tubes. For a glass façade, in terms of shading, the most important thing during summer is to reduce the heat transfer from the outside to the inside (by eliminating the external heat input), while in winter the solar heat accumulation is important (passive heating).
The cardinal orientation and the geographical location of the building generate the number, size (the length of tubes varies between 25 and 60 cm) and pattern of the tubes on the façade. The proposed solar control system can reduce the energy used by conventional air conditioning systems used to cool the interior space. The solar control system can also improve visual comfort of the people by reducing unwanted glow and reducing the contrast between the sunny and shady areas. This leads to an increased level of satisfaction and productivity among the users of the edifice.
The solar control system offers the possibility to get a slightly different appearance among façades with distinct cardinal orientation, but it maintains the unity of the overall image of the building. This can generate interest and human scale to a monotonous standard shading systems design. The metallic tubes are arranged according to the cardinal orientation - on the Southern side they are arranged in horizontal lines and on the Eastern and Western sides they are grouped in vertical lines – in order to provide effective shading in summer (Fig. 4).
Fig. 4 - Simulated image with the shadows of the tubes on the glass façade. (Image source: author)



## 4.4 Air filtration

The increasing number of antibiotic resistant bacteria imposed the need of finding new ways to fight against their harmful actions. In this respect it was found that metals such as silver, copper and stainless steel possesses attractive qualities in the fight against bacteria in the sense that the mere contact with the surface of these metals can lead to drastic destruction in the number of bacteria.

To streamline the benefic action of these metals, it is desirable that the bacteria exposed surface to be as large as possible. In this way a filter is placed inside each tube in order to filter the air from the exterior environment . This filter is made of a textile material covered with the afore mentioned metals in order to obtain active devices in terms of anti-bacterial action.

# 5 THE ARCHITECTURAL IMAGE OF THE EDIFICES EQUIPPED WITH THE PROPOSED GLASS ENVELOPE

The proposed envelope engenders new landmarks, elements of attraction and identity, for the people in the area where it is built.

Through the dimension and pattern of the intelligent metallic tubes placed on the surface of the façade and made in accordance with the geographical location and climatic conditions that define the building site, we can say that a relation of dependency is established between the architectural image of the edifice and the natural environment.

The nocturnal image of the envelope described in this paper is characterized by a dynamical artificial lighting generated by the RGB LEDs; the colour of the lighted façade, influenced by the outside temperature, changes throughout the year. The variation of the urban image of such a building can create an item of attraction for the local community (Fig. 5).

Fig. 5 - Day time and night time images with a building equipped with the proposed façade. (Image source: author)

## 6 CONCLUSIONS

The reaction of the glass façade to climate variations transforms the façade into an adapting envelope in relation to a dynamic environment.

The innovative envelope described in this aricle demonstrates the potential of the glass enclousure to be reinvented in relation to contemporary requirements , encompassing multiple functions designed to satisfy both aesthetic requirements and thermal comfort for people, as well as environmental and economic requirements, thus gaining an important place in the field of sustainable architecture.

Due to the mediatory part connecting the interior and the exterior space of a building and also because of the potential to significantly decrease the energy consumption of the buildings, the façades, both now and in the future will be a key element of sustainable design.

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# TEXTILE MATERIALS
# FOR THE FUTURE (ACCESSIBLE) ARCHITECTURE

**Beatrice-Gabriela JÖGER[1], Marilena NEGULESCU (LOHIN)[2]**
*[1, 2] "Ion Mincu" University of Architecture and Urbanism (ROMANIA)*
*beatrice_g.joger@ymail.com, marilenanegulescu@yahoo.com*

**Abstract**

Textiles are the category of materials with the highest weight in domestic interior design and an important one in public interiors. They were originally used as clothing and their use in interior decoration is merely an extrapolation towards the materialization of the envelope of the vital space, from the outer cover of the individual to the inner cover of the interior of the house. In the Romanian traditional culture there is an expression referring to the interior design with textiles: "the house is dressed-up". Textiles provides warmth to the space - literally and figuratively -, creates internal dynamic atmosphere and are easy to appropriate.

Unfortunately in most cases their use is often made empirically, the architecture projects not dealing with this side of the project and the interior architecture projects still represent, at least for the private realm, a very small percentage of the interior design actually realized.

The environment in which we live can be modified and can be improved and the positive change, the wellbeing resulting from a suitable adaptation of interior space for the user, can be reflected in its daily life.

Textiles are phono-absorbing, organic, bio-degradable and very flexible in use, and also in volume, and can take almost any form. They can unify or delimit spaces or suggest tresholds between them. The wider margin of the textile characteristics and subtle levels of transparency allow their use for unification of the interior atmosphere.

One of the difficulties which arise in front of architects-creators is that they are only the users of fabric (as in the other building materials, in fact) but in this case, given the proximity of the fabric's omnipresence in human life, the desire to intervene of the architect/ designer in creating the material itself is different, with some exceptions.

The perception of the surrounding space is done through colours, forms and volumes, and although there are certain patterns that are created under similar responses to colour, for example, however the individual structure and experience and the combining effects of the factors greatly influences the perception, so that one can not talk about definite models of response. One may only talk of categories of response, also shaped and determined by the social category, the cultural background and the *status* demonstration.

However, the architect may create disabilities through the designed space, by an unfortunate choice of interior finishes. Accessing the space through the full sensorial capacity is an ongoing challenge, from which may result more exciting spaces for interaction between humans and living space, interesting places to discover and map for all users .

For the visually impared or disabled persons, for example, the tactile dimension of the space and objects is of utmost importance in their perception.

Textile materials are present in the inner space through several features: color, volume, texture, even smell. It must be said that the physical and psychological effects of these features have already been studied and theorized separately (some, such as the color, for hundreds of years) or in terms of textile engineering and textiles for clothing but there is not yet a specialized complex study dedicated to interior textiles.

The share of textiles in interiors, their physical properties and their psychological effects recommends them as the ideal material for the easy adaptation of a built space to the specific needs of different architectural programs. Unfortunately, outside art-directing, where this material is fully utilized, the conscious, rational and programmatic inclusion in the interior architecture projects is performed only sporadically, and in our country is mostly lagging in the empirical/the classic use.

The study of the impact, the physical and psychological effects of the textiles on users of interior spaces could lead to a series of recommendations on how the interior design with textiles can be realized for both the public and the private sector. Recommendations would aim at: (a) improving the quality of space in general and implicitly, the quality of life regardless of the user's physical condition and (b) adapting spaces for people with physical and mental disabilities, using as main interior finishing the textile materials. Designing and building interiors in accordance with the principles of universal design (1. Equitable Use, 2. Flexibility in Use, 3.Simple and Intuitive Use, 4.Perceptible Information, 5. Tolerance for Error, 6.Low Physical Effort, 7.Size and Space for Approach and Use), the idea that what is good for people with disabilities is good for everyone is the paradigm of contemporary and future architecture and design. Moreover, given the global aging and hence the increased number of people with various disabilities, should be developed possibilities for general design and interior decorating of spaces, consistent with the principles of universal design.

Designing interiors must go beyond mere accessibility regulations. The accessibility should not be formal, should not exist only at the legislative level, but it should be a problem of the whole society, given that any of us can be for a shorter or longer period of time a person disabled by the environment and the society (as disability is defined in Europe). Accessibility should materialize through real examples, starting from small to a larger scale, from the interior as being the closest approach and with which one can inter-act the easiest way and continuing with the architecture of buildings and the urban space.

**Keywords**: textiles, architecture, interior, universal design.

# 1 INTRODUCTION

Textiles are the category of materials with the highest weight in domestic interior design and an important one in public interiors. They were originally used as clothing and their use in interior decoration is merely an extrapolation towards the materialization of the envelope of the vital space, from the outer cover of the individual to the inner cover of the interior of the house. In the Romanian traditional culture there is an expression referring to the interior design with textiles: "the house is dressed-up". Textiles provides warmth to the space - literally and figuratively -, creates internal dynamic atmosphere and are easy to appropriate.

Unfortunately in most cases their use is often made empirically, the architecture projects not dealing with this side of the project and the interior architecture projects still represent, at least for the private realm, a very small percentage of the interior design actually realized.

The environment in which we live can be modified and can be improved and the positive change, the wellbeing resulting from a suitable adaptation of interior space for the user, can be reflected in its daily life.

It is important to identify the cultures and the sub-cultures (in the anthropological sense) significant for the actual use, for the unambiguous relationship between culture and personality, their influences, in order to mark the cultural diffusion specific phenomena with transfers, spread and specific borrowing. The manner in which the processes of enculturation - similar to those of socialization – answer for the rules, rites, exchange, customs, conventions approved by the society in which the targeted segment lives, facilitates the practical application of cultural processes into the design process, that operate either towards change, either towards preservation, or towards the invention of patterns or habits.

# 2 TEXTILES IN THE ARCHITECTUAL SPACE

Textile materials have passed nowadays from an intensive interior architectural use to an extensive architectural, urban and landscape design use. The low weight, small volume and the free shapes it can embrace makes textiles an ideal construction material, especially for the ephemereal constructions. The architect's involvement into the creation process may vary from null to essential. For example at the industrial buildings a mere geometrical form is enough (sphere, semi-sphere, semi-thor) even for a unique building or a type with a low number of reproductions. But the creativity is of essence in case of the superstructures that often represent not only the outer skin of a building, but a sign in its own right, giving the building its identity, being that a permanent or ephemereal one.

For the present paper/study, we are referring only to the interior architecture use of textiles, although in more ways than the traditional ones. In addition, the study refers to the domestic environment, bearing in mind that the experiments and discoveries can be also applied to the public realm.

The textiles employed in interior designs succeed in humanizing a neutral space, perhaps even more when they comprise natural materials such as wool, cotton, linen, hemp, raw materials that suggest psychical warmth, or because we associate them with handwork, with manual weaving. The pleasure of "*touching the house*" can be achieved also through employing textile materials with textures, models and colors that invite to a tactile exploration. "*The experience of home is essentially an experience of intimate warmth.*" (PALLASMAA, J. 2005: 58)[1]

## 2.1 Categories of textile materials used in interior architecture

Following the elements with which an architect is creating the interior architecture, one can differentiate four big categories of interior textiles: (1) flooring textiles (rugs, carpets, moquette etc.); (2) wall textiles (going from wallpaper to tapestries, through various kind of drapery); (3) space separators (folding screens, screens etc.); (4) upholstery textiles.

Textiles are phono absorbing, organic, biodegradable and very flexible in use and in volume, and can take almost any form. They can unify or delimit spaces or suggest thresholds between them. The wider margin of the textile characteristics and subtle levels of transparency allows their use for unification of the interior atmosphere.

[1] Pallasmaa, Juhani, 2005: *The Eyes of the Skin*, Great Britain, Wiley-Academy

## 2.2 Textiles - an interdisciplinary field of research

One of the difficulties which arise in front of architects-creators is that they are only the users of fabric (as also in case of other building materials, in fact) but in this particular case, given the proximity of the fabric's omnipresence in human life, the desire to intervene of the architect/designer in creating the material itself is more present. The solution is the interdisciplinary research, through which the architect and other specialists work together in obtaining a fabric with the characteristics needed in an interior created by the architect.

Although the research in textiles is focused on wearables, maybe more than in those, the contemporary and future possibility to embed various properties to textiles is appropriate for the interior ones.

Currently there are the most diverse researches and applications in terms of the relationship between textiles and new technologies. The existing technical possibility of introducing sensors for different parameters like: temperature, light, humidity, pressure, beat (heartbeat) - led to innovative wearable pieces that are able to monitorize a person's health status. For the wearables, the state of the art is going from using existing electronic components to the research in creating of specific materials through nano-technology that is embedding the same or more characteristics but at the nano scale.

The interior materials may even benefit from the advance existing in the wearable domain, as their way of use does not absolutely need nano technology. There are fluorescent textiles, carpets with LEDs or optical fibers braided in the fabric that activate at a simple touch, textiles that can be programmed electrically, electro-luminescent textiles, textiles made from various materials such as strawberries, wine, coffee, basalt etc. and textiles that can change color depending on the mood of the person using them. Pieces of furniture may contain pressure/weight sensors that activate various functions when used and as such, the monitoring of the user is automatically realized.

# 3 INTERIOR ARCHITECTURE, UNIVERSAL DESIGN AND TEXTILES

## 3.1 Perception of the space

The perception of the surrounding space is done through colours, forms and volumes, and although there are certain patterns that are created under similar responses to colour for example, however, the individual structure and experience and the combining effects of the factors greatly influences the perception, so that one can not talk about definite models of response. One may only talk of categories of response, also shaped and determined by the social category, the cultural background and the *status* demonstration.

It is true that the architect may create disabilities through the designed space, by an unfortunate choice of interior finishes. Accessing the space through the full sensorial capacity is an ongoing challenge, from which may result more exciting spaces for interaction between humans and living space, interesting places to discover and map for all users.

For the visually impared or disabled persons, for example, the tactile dimension of the space and objects is of utmost importance in their perception. Phenomenology specialists have been drawing attention to the importance of the senses in architecture, to the tactile-kinaesthetic nature of perception, to the importance of past experiences of the architect or designer in designing a certain space.

Textile materials are present in the inner space through several features: color, volume, texture, even smell. It must be said that the physical and psychological effects of these features have already been studied and theorized separately (some, such as the color, for hundreds of years) or in terms of textile engineering and wearable textiles.

The proportion of textiles in interiors, their physical properties and their psychological effects recommends them as the ideal material for the easy adaptation of a built space to the specific needs of different architectural programs. Unfortunately, outside art directing, where this material is fully utilized, the conscious, rational and programmatic inclusion in the interior architecture projects is performed only sporadically, and in our country is mostly lagging in the empirical/the classic use.

## 3.2 Universal Design and private space

### *3.2.1 What Universal Design stands for*

Designing and building interiors in accordance with the Universal Design principles, the idea that what is good for people with disabilities is good for everyone is the paradigm of contemporary and future architecture and design. The seven principles of universal design are 1. Equitable Use, 2. Flexibility in Use, 3.Simple and Intuitive Use, 4.Perceptible Information, 5. Tolerance for Error, 6.Low Physical Effort, 7.Size and Space for

Approach and Use. Moreover, given the global aging and hence the increased number of people with various disabilities, should be developed possibilities for general design and interior decorating of spaces, consistent with the principles of universal design.

Designing interiors must go beyond mere accessibility regulations. The accessibility should not be formal, should not exist only at the legislative level, but it should be a problem of the whole society, given that any of us can be for a shorter or longer period of time a person disabled by the environment and the society (as disability is defined in Europe). An unadjusted space is the one that disables an individual due to architectural barriers that one can encounter. The Disabled People's International (DPI), defines a disability as being "*the result of the interaction between a person with a disability and the barriers that appertain to the social environment and the attitudes with which that person comes in contact to*" (http://www.onphr.ro/dizabilitatea/ce-este-dizabilitatea).

### *3.2.2 Textiles and the private space*

Although the interior architect/designer works with the interior of the architectural object, the interior of a house is a private and privileged space, conceived after and defined by the personality of the inhabitant, one's inner self, in order to become a "home".

Considering the comfort the textile materials render to clothes, textiles are materials easy to appropriate to their employment in interior architecture. Just as the clothes one wears define the character of the user, in the same way the house is personalized, humanized and profoundly hallmarked so to reflect the personality of its inhabitant.

Inside houses, one can better notice the impact these materials have on the human psyche. Every one of us tries to accomplish in its private house a space as comfortable as possible, where one can retreat and calm down after being in contact with the agitation of the exterior world. This is the propitious space to discover, develop and meditate on your inner self.

### *3.2.3 Senses and users*

Perhaps the first characteristics when one thinks of textiles is the tactile sensation. Experiencing a space through all one's senses is easy. Experiencing the same space with a limited sensorial capacity makes one to enhance the remaining ones.

Take for example the tactile sense. Through the tactile sense, a direct bond is created between a person and the environment. By touching we interact with the materials, we discover its features, we appropriate it if we like it and we reject it if the sensation that was conveyed is unpleasant. Natural materials, thanks to their organic energy, are easier to appropriate. An interior space predominantly tactile can be created with the help of textures, which render different qualities to the surfaces. Textures may have different characteristics: smooth or rough, mate or glossy, wrinkled, knotted, with cuts, stripes, dots and a myriad of other alternatives.

The interior architect has the role of choosing one of these alternatives, to arrange, combine, associate or light them in such a way as to imprint the personality of the inhabitant into the result. A soft leather couch, some fluffy pillows, linen or silk beddings, the texture and type of the wallpaper, a soft carpet etc., all can produce a wide array of emotions and can become later on sensorial benchmarks in mentally rebuilding the image of a certain space.

### *3.2.4 Special category: Visually impaired persons*

A special category of users for which employing textile materials inside the dwelling is of paramount importance are blind or visually impaired individuals. The tactile perception for visually impaired people has an essential role in the direct interaction between the subject and the objects around. The act of touch is coordinated and codified under the influence of the language and the previous perceptive experiences. A visually impaired individual can know solely by touching once if the material is the one they desire, if it makes them feel uncomfortable or does not convey anything special, visually impaired people being able to choose materials, possibly as inspired as the interior design specialists, due to their permanent practice of the tactile sense.

Visually impaired people can perceive the shape, the size, the material or the spatial relations between objects, but cannot make appeal to information supplied through sight. They compensate the information offered by sight through developing and using the other senses throughout their lives. In exploring the interior space (the one at hand), the main analyzer will be the tactile kinesthetic one, followed by hearing, olfactory and gustative senses. When outside, the main analyzer employed for orientation will be the hearing sense, then the tactile one, the olfactory and gustative. The interior of their own home must offer the comfort and security which results from a good command of the space, an easiness of identifying and differentiating the functions specific to the dwelling, through the personalization and adaptations of the space in accordance to their own needs and esthetic preferences. The interior architect should adapt its project and the presentation method to these requirements,

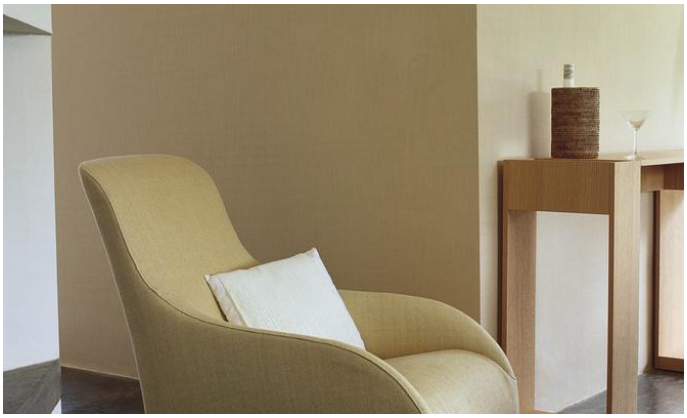
through an appropriate design of the interior spaces for this category of beneficiaries, otherwise its design could disable through the created space or an unfortunate choice of interior finishing. The house should not become a hostile environment in relation to the deficiencies of its users.

Visually impaired individuals possess a special type of perception that is named eco-location; hence, they can orient themselves in a space by employing their hearing, as a sense that developed in time through repeated simulations, compensates the lack of vision. They can locate obstacles thanks to sound reflection, the echo produced by the resonance of certain materials. "*Certain visually impaired individuals hit the floor with their special stick, to produce sounds; others stomp the ground with their foot and others make a special sound – like a pop – using their tongue and the palate. The ear receives the echo, while the brain analyzes it, the result being a sort of tridimensional «auditory image» of what lays around".* (DAMASCHIN, D. 1973: 85).[2] In the home of a visually impaired individual, the background noises can distract one's attention from the information offered by the important sounds used for spatial orientation. "Interiors *are like large instruments collecting sound, amplifying, and transmitting it elsewhere.*"(ZUMTHOR P. 2006: 29)[3]

Sounds can be toned down with the help of textile materials by using velvet or thick fabric for curtains, by using tapestry, by finishing the walls and ceilings with antiphonal materials, using carpets against structural noises.

The textile materials employed in the homes of visually impaired individuals stimulate the touch and at the same time contribute to bettering the comfort and implicitly the quality of life of these people.

One option to guide visually impaired people inside a house can be put into practice by separating the different areas of a house through linking different textures and materials to those areas.

Images 1 and 2. Textile wallpaper[4]


Images 3 and 4. Textile wallpaper[5]

Here is an example by the designer Anne Kyyro Quinn, who created felt panels for wall covering. The material, besides its distinctive texture, it is also a very good sound proofing one, increasing the physical comfort of the space's users.

[2] Damaschin, Dorin, 1973: *Defectologie*, Bucureşti, Editura Didactică şi Pedegogică
[3] Zumthor, Peter, 2006: *Atmospheres*, Basel, Birkhauser- Publisher for Architecture
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[5] Images sources: http://www.elitis.fr/en/wallcovering/collection-alliances-130/drawing-vases-32#.VPK8pXysVBk and http://www.elitis.fr/en/wallcovering/collection-geisha-134/drawing-shinjuku-35#.VPK8-HysVBk accessed in 20 february 2015

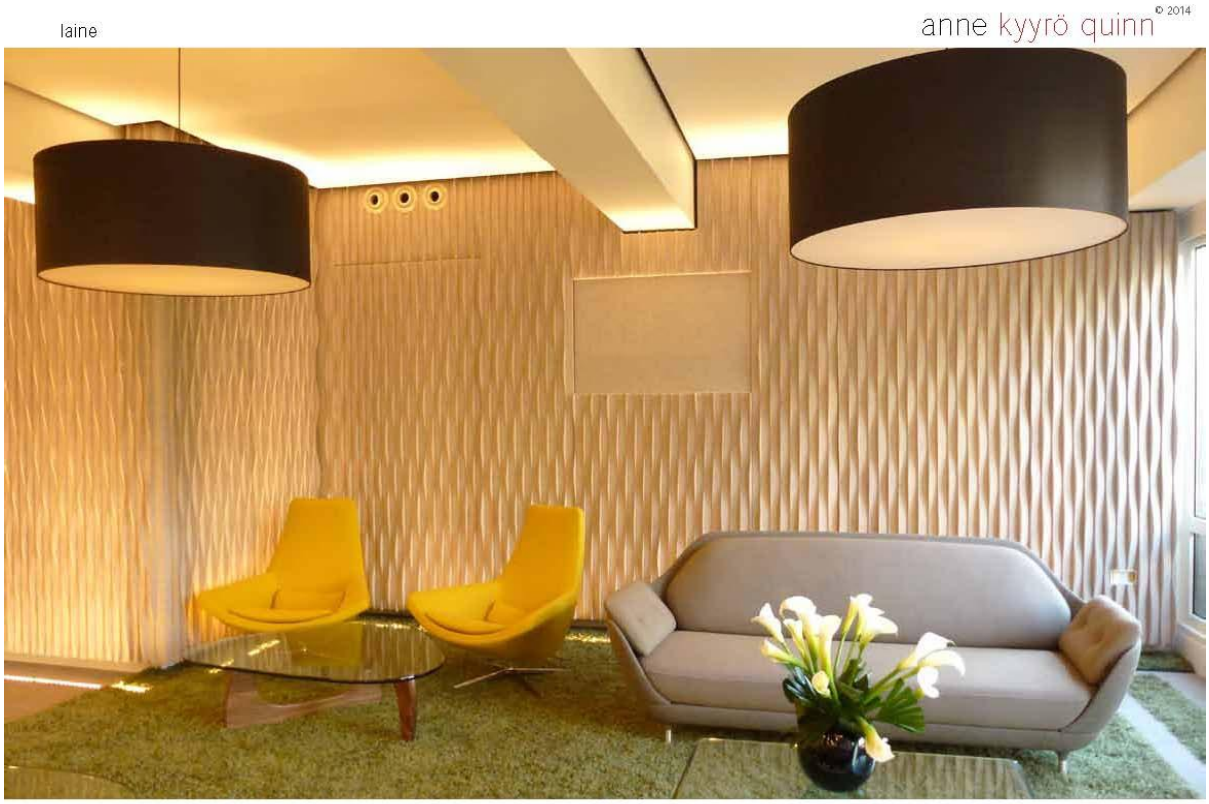


Image 5. Anne Kyyro Quinn felt panels design[6]

Another option would be a smooth change at the floor level, like the texture of the finishing or of the carpet, creating a flowing and easy to follow route.

Images 6 and 7. Textured carpet design[7]

### *3.2.5 Special category: Spaces for multi-sensory stimulation*

Choosing the appropriate type of textile materials, models, textures and colors has a tight connection with the ambiance that one desires to create, an ambiance that can prove therapeutic, such as the Snoezelen rooms for multi-sensory stimulation. Employed as therapeutically spaces inside hospitals, recreation spaces, in day-centers, in educational institutions, in nursing homes or inside dwellings, the Snoezelen chambers stimulate

[6] Image source: http://www.annekyyroquinn.com/about.html accessed in 12 february 2015
[7] Images' source: http://www.topfloorrugs.com/pinboard/blog/ and http://tikkat.com/house-rugs-decoration accessed in 12 february 2015

the users' abilities through sensory development (hearing, sight, taste, smell and touch), ocular-motile coordination, cause and effect, language development, environmental control and relaxation. These rooms create a favorable environment for stimulating activities and experiences that are used to increase awareness and positive behaviors for people with severe sensory or neurological damages. A multi-sensory environment is beneficial to therapy because it brings the needed relaxation; it easier opens ways to communication and interaction and brings more responsiveness to speech therapy.

In addition to light, music, sounds, smells and textures play an important role in these areas. Thus, proposing and using textured fabrics with varied tactile properties, sensations can be stimulated arising interest, reactivating memory, inducing a state of wellbeing and creating a feeling of safety and security amid deep relaxation.

Choosing textile wallpaper, its pattern, texture and color within these spaces are very important and can have a relaxing, soothing effect. The diversity of existing textures for the curtains, carpets, ceilings, furniture, contributes to creating the specific atmosphere desired by the therapist. Touching is calming, the simple gesture of holding a pillow in your arms, soothes, calms any of us in difficult times, but if this same pillow is made of a material pleasant to touch, has a shape and a stimulating pattern, it increases the efficiency of the proposed treatment.

Image 8. Pillow designed by Stephanie Marin[8]

The color of such a room and implicitly of the existing materials can be changed by projecting the colors yellow and orange for asthenia and depressed – colors recognized for their dynamic properties, for anxious a very light blue – a sedative color to relieve pain, pink – a calming color.

Image 9. Snoezelen chamber[9]

[8] Images sources: http://www.smarin.net/en/editions/livingstones/accessed in 12 february 2015
[9] Images sources: http://www.rueckblick.coburger-designtage.de/cdt_2010/35-0-obergeschoss1.html accessed in 12 february 2015

Images 10. Snoezelen chamber[10]

The interior architect can encourage sensory development by designing interiors in which the fabrics can have shapes, textures, patterns and colors of the most varied kind, creating specific atmospheres, easily recognizable. The involvement of touch, along with the visual and olfactory senses, lead us to a deeper discovery of a new space, the emotions experienced through the perceived sensations, helping us to remember it and to easier realize associations between the various areas covered. If these innovations are used intelligently, with the aim to help a greater number of potential users and not just to keep up with the latest trends in interior design, they can develop this specific field in a positive way.

## 4 CONCLUSIONS

It is important to open new lines of research through scientific methods of how the use of textiles in interior architecture influences causes and contributes to the perception of space, through the physical and psychological effects on the user.

Even if the interior finishing with textile materials' field is not explored enough yet, through experimenting different types of textile materials may result products usable in multisensory designed spaces, leading to the development of this segment of interior design. Design and interior design following certain recommendations, opening the interior architecture towards the interior multi-sensory spaces, can only improve the quality of living space, of interior design, can only develop this specific area.

If the anticipation in the complex housing design process can still be predictable, when social actors are easily identified with rules, references and cultural areas, in a world without layers, roles and rules, an anti-structure

[10] Images sources: http://www.snoezelen.sk/registerzariadeni/rz-dss_integra.htm accessed in 12 february 2015

type of world - as architect J.F.C. Turner defines it -, knowledge in terms of anticipation may come from the experiment rather than the process.

In view of the cultural responses we aim to find, we believe it is important to know not how textiles can be used in human's life, but rather paraphrasing Turner when referring to the architecture, what they can do of human's life ... especially the one for which others decide.

Accessibility should materialize through real examples, starting from small to a larger scale, from the interior as being the closest approach and with which one can inter-act the easiest way and continuing with the architecture of buildings and of the urban space.

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# CRISIS, POETRY, PROCESS, ARCHITECTURE

**Angelica Stan**[1]

[1] *"Ion Mincu" University of Architecture and Urban Planning, Faculty of Urban Planning, Romania*
*angelicastan@yahoo.com*

**Abstract**

Starting from the idea that the crisis is, beyond failure, a benefit time for re-thinking, we present here the relationship between poetry and architecture, observed by the creation processes of both. As long as the crisis philosophy of this century seems to be related to the need to get out of the previous paradigm of surplus and excess, architecture cannot be anymore judged in terms of "simple" object, but rather as a process that gives rise to objects that enables new types of consumers and uses. Under the condition of crisis, the new intelligence of architecture is conceived as a better (sustainable) balance between resource and use, between materials and language, between scale and effort. Looking through these goals and in the same time considering some of the main architects that had write about the poetry of architecture, the paper explores the field of poetic expressiveness in architecture, from the point of view of poetic language, as it is conceived by literates and theorists.

The place of poetry in the artistic creation process is essential, situated right at the root of the conceptual thinking, as power to summarize an idea in a precise and essentialized form of language, without unnecessary admixtures. If poetry is this ability to give words maximum strength of expressiveness within a minimal material (written) form, in the spirit of economy of language and accuracy of "material" used, so the architecture (always, but in times of crisis, the more) is just the same process of conceptual sublimation (of materials, light, scale, proximity, etc), in order to address a future world that will certainly refuse the waste, the excess and the ostentation.

On the other hand, in today cities, poetry is most of all present on the streets, squares, parks and gardens, at the disbanded outskirts, on the highway maybe ... anywhere but less than in architecture as object. (Of course, with notable exceptions of great architects and poets!). But for the most part of "architecture with no famous author", something is lost on the way from the computer, to the built and used building, from the initial thinking, to final expression and reception by people. The poetry of common architecture is more like a direct process of livable spatiality, in which every of citizen could invent its own language.

Today, coming with the latest technology of communication, something has changed in the poetry of urban life itself, so that the object cannot find the correct capacity of expression, and attraction, perhaps by over-bidding of its components, or by a "non-adherence" to an inhabitant which is always else, always kept in an outgoing connection. Overcrowding, congestion, excessive fill, excessive communication give rise to a need with opposite sign: the silence, the gap, the pause, the isolation. The break between city "verses", the break in the full-empty, top-down, bottom-top, inside-out continuum(s) is probably the breathing space of (urban) poetry itself, which must be re-searched, re-articulated, re-worded.

It is already shown that the ambiguity is a beneficial function of both city and architecture. The poetry of these very actual communication processes includes the architectural object that not only occupies a physical urban space, but has to make sense and to resonate into a much bigger system/ networks of multiple meanings. In the same time, to remain comprehensible,

the architecture should be part of a poetic process, through which the city makes visible its meanings.

The great lesson on architecture and poetry was given maybe with Heidegger's famous discourse on the verse of Holderlin "Poetically Man Dwell" (dichterisch wohnet der Mensch)- or perhaps rooted in the book of John Ruskin, 1923 (The Poetry of Architecture), but things did not stop there. From Vincent Scully, Louis I. Kahn, Charles Moore, to FL Wright, Mies van de Rohe, Peter Zumthor, Robert Venturi, Rem Koolhaas, Libeskind, Frank Gehry and other famous architects have contributed to shape this field of poetic architecture as a process underlying the act of creation itself. But nowadays, this issue should be viewed differently: the poetry of architecture needs to be found beyond the built object itself, beyond its ephemeral glory.

This issue is approached here as a process that fits into the wider city's metabolism, in the great epic poem of urbanity. In the designing process of urban space, the creativity is challenged, in the current period, not just by the usual constraints of the crisis and of its true experience of many abandoned, unfinished buildings or un-built projects, but also from the newest needs of people, due to the new mobility, ubiquitous communication and inter-connectivity, and from a different perception of space.

For instance, how in these permanent network communications interacts with the architecture message and language? Is it a matter of harmony of languages which currently jams? Is it a matter of translating our actual language habits in an appropriate built form? Moreover, today the tool called "poetry" is not anymore just in the hands of "certified" poets; it tends to be handled by anyone that feels to say something about the reality and truth of the present. He is in possession of the architect, but at the same time it is spread out in the look, the steps, the body and all the senses of one who uses any architecture.

**Keywords**: language, innovation, experiment, technology, process

## 1 CRISIS, A MATTER OF HARMONY?

Probably today the main problem of architecture is the cessation of its old conceptual patterns. The way in which people perceive the city is intrinsically linked to the way in which the architecture is practiced - not only at the object's level, but as principles underlying its creation. Things which are felt by the cities inhabitants as inhospitable, inappropriately, useless, or even overwhelmingly, negative, evil, morbid, wasteful, etc. are essentially the answer given to architectural concepts conceived to the scale of objects, made to respond to certain human needs, but which get to shape the urban life in its totality in already obsolete patterns.

Disharmony of the city is felt today just as lack of coherence. Diversity, so beloved by postmodernists, is today a scrapped currency: we are different, but it happens that the differences make us more similar, than distinguish us. More and more studies of current urban life, incorporating perception, movement, technologies or people's representations about the city assert that the urban world, beyond the success or failure of its architectures, is deeply resilient: a sophisticated, versatile, just alive entity, and through yet, harmonious, speaking about language at another scale and meaning - neither architectural, nor poetic.

On the other hand, the poetry of architecture was also in search of a certain (classical) harmony - as composition, materials, scale, light, context, expression, etc. The brevity and precision associated to a poetic form were considered same qualities that make a valuable piece of architecture.

The work that has established first this comparison between architecture and poetry is the book of John Ruskin, The Poetry of Architecture 1. But at the time, Ruskin could not question the problem that in architecture, the compositional harmony is as less important as it is the rhythmic verse and rhyme in poetry. And that the appreciation of architectural value, the same for a poetic value, in terms of these qualities is at least obsolete, if not, nowadays, even lead to a miscarriage of the reception of its content. Why not to say that for any respectable contemporary poet, writing with rhyme is equivalent to an act of self-mutilation. Much more care and energy are consumed in order to stabilize a poetic idea, a state of mind, a perception, an atmosphere, in order to create the

necessary "chemistry" for the creation of a new world. And for this seems to be authorized any tools: poetry could be rant, played, slam, relational, computational, algorithmic, etc. and by this don't loose any of its essence.

## 2 POETRY AND ARCHITECTURE - LINKS AND SEPARATION

From the point of view of architects, we can consider that it's quite clear, as we take in consideration Zumthor's book "Thinking Architecture", where the architect explains the poetics of (his) architecture and his personal sources of inspiration, by framing the self-observation within the process of design. From the composition, “presence” of the materials, to proportions and light, the poetics of architecture is revelead as something being part of the process of design, and it's only need to follow them as some steps to get in the final to the poetry of architecture. Peter Zumthor pointed out on the architectural atmosphere as "this singular density and mood, this feeling of presence, well-being, harmony, beauty.", ”a beautiful silence that I associate with attributes such composure, self-evidence, durability, presence and integrity, and with warmth and sensuousness as well: a building that is being itself, being a building, not representing anything, just being.”[2]

But all this remain very abstract and the assertation seems to be a univoque direction, from the point of view of an architect about the meaning of poetry (as poets and their work are something quickly understandable and explainable. It's simply to say that poetry informs architecture - all architects know this- and the same, that all poets were (at least one time) attracted and stimulated by the meaning of architectural space. But which are more exactly the point on which the poetry and architecture join together or separate each other? At which levels are disputing the relationship between the two arts, and in which way they can feed each other? Are so easily to be commuted the values of the poetic language to/ in the values of architectural language? Besides the pleasure of finding poetic explanation of architects work, we rather are interested about how really works from both direction this relationship.

### 2.1 Structure

Poetry is made by words, which are something not material, something ineffable; but also words in poetry create different structures, as well as column and beams create structure in architecture. Here we consider that it's a confusion, that bring prejudice both to poetry and to architecture, and this confusion came from a lack of more profound culture about how poems and buildings are made. From the classical period, we are tempted and learned that a good piece of poetry is one with a clear shape, expressing a perfect balance between the most "weight" words and metaphors, which figure its structure. And thus, transferring this attendance to architecture, a good building seems to be one with the most clear structure, or (is accepted in stead of this) a powerful structure. Very often architecture is hidden behind its structure, meaning that the structural qualities are most appreciated: highrise buildings, or built in difficult conditions of soil, or very strange still structures, so on, are keeping the top of most appreciated pieces of architecture. From the Vitruvian principles we know that "firmitas" is one of the most important qualities of a good architecture- and this is of course something we cannot deny, as architecture is done for people to live in. But the discussion should pass over these basic elements, as for discussing (appreciating or criticizing) a poem is obvious the first need to know the language in which it is written.

The poetry of architecture speaks about the meaning of the space created, of the interior- exterior relationship, of the intelligence answer to a context. All of this are hidden in the building structure, the same as a deep meaning is hidden under an ambiguous structure of a very modern poem. So, pretending to architecture to "show" it's clearness and power, is something the same wrong as is to pretend to a poem to show a false clarity, in stead of suggesting the deep roots of its meaning. For a long period, it was considered that the structure of a poem consists more precisely in its metaphors - not at the verse level, but at the level of the entire poem. Both architecture and poetry evaluated so much as the most inappropriate appreciation of their qualities is to assimilate the structure with the meaning and concept. That's also because of the technology which deeply changed the structure in both cases. For architecture is obvious. For poetry is less obvious, but it is clear that the new technologies of communication are constantly changing the way in which the structure (of thoughts, of language, of tools) of a poem is created. And the same mistake was done for architecture: considering that the meaning of a building is equal with its structure qualities.

### 2.2 Context

At this point, the link architecture - poetry is very strong, but it comprises also a contradiction. Even both architecture and poetry depends on the context in which they are done (political, economical, spiritual, different schools, critics, different influent masters, etc.), there is a distance between them when we speak about the relationship between the final work and its reception. In a recent interview, the Turkish poet- architect Cengiz Bekt says that "a poem is just between the reader and the poet. But in architecture people are living in the

structure, many people, not just one. The purpose of a city is to bring in people to live and enjoy it, whereas poetry is a one-to-one communication" 3. Still we can admit, especially nowadays when publishing poetry on blogs and websites became something normal, that the audience (real or virtual) strongly contributes by shaping the inside structure and even the meaning of a poem and of a piece of architecture. For both arts, the existence and the resilience of the final "product" depend on the dialog which it creates and maintains. Maybe a slight difference can be notice on the fact that some pieces of architecture, even they starts a dialog with the community, they can be rejected by the phase of project, within the process of approval, by the democratic and very actual process of public consultation, while poetry doesn't need the positive reception of a majority: it needs only some positive reviews from some important critics, and can became famous overnight, despite the opinion of the rest.

## 2.3 Language

In his essay "What is poetry" Nicolae Manolescu entitled one chapters "Metaphor is not poetry" saying that "the poem is not just simple language more expressive, colorful and picturesque than the usual one: it's the language becoming literature" 4.

It is considered that the closeness between architecture and poetry is based a lot on language, on the fact that authors create by using the language used a new world. For poetry, this is ascertainable and true, as long as "poem (....) requires the being to the world it creates, but this world, although singular, does not completely different from the ordinary world", but granted on the latter, and sometimes poem does only to provide a (another) grid understanding and feeling of the real world 5.

Metaphor and metonymy in the poem have this function to transport the meaning from real-world to the world of the poem and back in the real world. But also they correspond to certain specific processes involving acceptance of the poetic ambiguity and the literality as features of poetic language 6. But as for poetry, the mimesis between the two worlds is more like a trap, so in architecture, the mimetic language between object and context does not necessarily lead to a higher value. The architectural language is often considered to be valuable for its continuity over time, either for the novelty introduced in a context. But because we are not use to judge architecture from the point of view of poetic meaning, we lost the idea that language itself can become an opera, a value by itself. In this moment, we can discuses some great architects for which the architecture stake is not yet failed or abandoned to commercial condition - but this is not the purpose of this paper. More importantly for us is to notice that at this chapter of the language is still present a distancing, even a contradiction between poetry and architecture: if poetic usually relies on things that have to do with the ephemeral, the fugitive, emotion and intuition, architectural language is rational, visual and static, and it is constrained by a particular limiting its expressiveness. Jean Nouvel speaks of a certain essence of architecture that can be achieved only by removing the visible area of materiality, the removal of form and space, and Baudrillard considers that "architecture exists only as event" 7.

## 2.4 Morphology

Many times it was considered that through its spatiality, the architecture spreads out the ideas underlying its conception. Thus, it can shape the personality of those whom it is addressed (individuals or large communities), being sometimes the bearer of a certain ideology. The internal morphology of a building is not just a composition of functions and spaces that meet mutually, but finally it issues a message and leads in a way the lives of those who use it.

Also, the morphology of a building is an essential way to shape the light, the filled and the emptiness: a gesture of installation/ "clearing" (Heidegger) done by man in its right place, a daring gesture as it is the word breaking the primordial silence. The game of openings on a facade may seem to someone as easy as the game of rhymes and verses on the poet white page, but they express the same essence of creation which is based on the desire to impose a thought, an intrinsic intentions of the creator. "Silences, pauses and spaces are necessary for architecture.(...) Architecture has an inside, a space inside. (...) There is considerable versatility in modern poetry for the poet to use silence to emphasize his message".8

But it can go further, to the association between the city morphology as a result of the multitude of individual and collective gestures of assuming/ shaping the urban space and the language morphology of the literature that informs the city. Between the two morphologies, at a closer look, the boundaries are erased. Cityscape is the form of words about the city- poetry or story. The literature "feeds" the city with places and meanings and equally, the city nurtures literature. The forms of expression overlap and mix. Architecture becomes a character in this work both individually and collectively, in this performance which simultaneously writes and builds itself.

## 2.5 Truth

If architecture is built mental space (Juhani Pallasmaa), then the poetry of architecture is set up in the mind of everyone. The mental world of architects is just one of all mental world of human being which can "produce" architecture- and maybe that's way the term of architecture escape from the domain of building in another domains, less tangible - as informatics (architecture of networks, or of systems ). "Buildings do not merely provide physical shelter and protection; they are also a mental mediation between the world and our consciousness; architectural structures essentially structure and articulate existential space" 9.

Quoting Gaston Bachelard which states that a house is "an instrument with which we confront the cosmos", at the scale of the entire city, the "built poetry" correspond to millions of minds that have confront their life with the cosmos, and do this not only as "functions", but also by their "hidden" needs and processes - as dream, hope, trust, believe, so on. "The house protects the dreamer; the house allows one to dream in peace… [T]he house is one of the greatest powers of integration for the thoughts, memories and dreams of mankind" 10.

"Architecture focuses on lived experiential essences and mental meanings; this very focus also defines the architect's true approach and method" 11. As Jean-Paul Sartre states: "Essences and facts are incommensurable, and one who begins his inquiry with facts will never arrive at essences. […] understanding is not a quality coming to human reality from the outside; it is its characteristic way of existing." All artistic works, including architecture, seek this natural mode of understanding that is entwined with our very act of being. Consequently, the true essence of architecture does not arise from theoretical knowledge, or an aesthetic aspiration; it originates in our existential desire. 12

Jorge Luis Borges describes memorably the essence of the poetic experience: "The taste of the apple […] lies in the contact of the fruit with the palate, not in the fruit itself; in a similar way […] poetry lies in the meeting of poem and reader, not in the lines of symbols printed on the pages of a book. What is essential is the aesthetic act, the thrill, the almost physical emotion that comes with each reading" 13. Constantin Brâncuşi, the Romanian master sculptor puts it even more succinctly: "Art must give suddenly, all at once the shock of life, a sensation of breathing" 14. Similarly, the meaning of architecture emerges in the unique encounter of space and the person, in the very merging of the world and the dweller's sense of self. In the poetic survey of architecture as well as poetry, the perceiving and experiencing self, the first person, has to be placed in the centre.

## 2.6 Temporality

Certainly, there is an issue about the different approaches of temporality in architecture and poetry. For architecture (at least in the classical view), the temporality is related with the reception by people, being the measure of how long, or how much a building can be used, acting also as a mirror of buildings (and urban tissues) resilience. The more a building resists and continue to be alive (to be used and useful), the more its value is arising, and through this it became poetic, by accumulating all narrative contexts through which it had passed. In a way, this assumption could be similar for poetry: the most it resists over time and its read and published, the most valuable seems to be. Still, here it's need a more precise observation: there is lots of old famous poetry that says not much to younger generation, but it's still fashionable to keep it as reference to a glorious past. On the other hand, the temporality in poetry is not only about its reception by "public", but also bring into discussion the time as vehicle of transforming the reality into the poetic worlds created by poets. The same, in architecture, became clearer that the logic of a building - from structure to language- is depending to the manner in which the architect negotiates the relation with time. There are buildings thought from the beginning to become ruins and to die, as there are buildings made to pass over time, and to remain almost the same as at the beginning. The transience/ permanence in architecture it is an issue that re-questions about the place and the relationship subject-objects. Kant introduces the notion of temporality related to perception, and to an ever incomplete comprehension of objects, and also put an accent on the succession and simultaneity, as specific features of temporality.

More recent, Juhani Pallasmaa in the book "The Eyes of the Skin: Architecture and the Senses", quotes with the concept of temporality in terms of dimension of a multiple sensorial perception: "In memorable experiences of architecture, space, matter and time fuse into one singular dimension, into the basic substance of being, that penetrates our consciousness. We identify ourselves with this space, this place, this moment, and these dimensions become ingredients of our very existence. Architecture is the art of reconciliation between us and the world, and this mediation takes place through the senses" 15.

# 3 THE PROCESS (AS) IN BETWEEN POETRY AND ARCHITECTURE

In this context of so different elements that influence the relationship between poetry and architecture, we noticed that there is a common thing from which it maybe could start a proper research, and this is the process by

which a current language became a poetic language - both in case of architecture and poetry. The process through which structure, context, language, morphology and truth transform themselves and re-create into an indeterminate corpus of elements which are able to make sense. This process is a poetic one and it's necessary to understand the poetry as a discourse which doesn't regard a common communication, but a discourse which can be either metaphoric or metonymic 16.

The actual poetry phenomenon reclaims a deeper understanding of poetic vehicles and dynamics. Following several authors, we can notice a clear distinction between a referential poetry (anti-metaphorical, and metonymical), and a connotative poetry (ambiguous, and metaphoric) (Military, 2011). But even this distinction is under a sign of incertitude when is about the modern poetry. The language of modern poetry is the most ambiguous and in the same time, the most literal. It's reveals a individual use of language, as the poet doesn't try to express something through the language, but invents a new language, specific to what he wants to say. The poet says exactly what he wants to say 17. This assumption is coming against of what Robert Venturi appreciates: that the complexity of architecture is coming with the ambiguity and the tension. "Elle est forme et fond, abstraite et concrète, et sa signification découle tout autant de ses caractéristiques internes, que du contexte particulier dans lequel elle s'insère. Un élément architectural est perqu a la fois comme forme et structure, matière et matèriau. De ces relations alternatives, complexes et contradictoires, procèdent l'ambiguité et la tension qui caracterisent l'atmosphère architecturale" 18

On the other hand, other philosophers and theorists have often consider that architectural metaphors help "explaining" their writing: considering that "the temporal regime of the domus is rhythm or rhyme"(Lyotard 19), using architecture to represent authority and social order that might be undermined by the destructive act of the individual (Bataille 20), or proclaiming the canny as a cage that represses the uncanny (Vidler 21).

We cannot illuminate in a scientific sense this obvious contradictions between architects, theorists and literates about poetry and the poetic language. But the way in which during a crisis (economic, but also social and cultural, as a consequence) the poetry arises as a solution to explain the unexplainable and untranslatable situations, proves enough about the fact that between architecture and poetry there is a space of fertile indeterminacy, but which can also act as a trap. It became also evident the fact that architects speak with a too great legerity about the poetry of architecture, and about the processes that produce the poetic sense and value.

Much more adequate and efficient in this issue seems to be the discourse of young researches acting on the border between "real" architecture and "real" poetry, so creating a fuzzy zone of debates about how producing - instead of analyzing the product itself. They are speaking about participatory spaces - both at architectural and poetic level, or a collaborative space which tries to capture this dynamic relationship, by the effective experience of creation 22.

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# INNOVATION, CREATIVITY, DESIGN, EDUCATION

**Melania Coralia Maria Dulãmea**[1]

[1]*University of Architecture and Urbanism "Ion Mincu" Bucharest (ROMANIA)*
*melaniadulamea@yahoo.com*

**Abstract**

The ever changing conditions in nowadays societies require new skills for future professionals; education must adapt to this new conditions and develop new principles and methods. Creativity is considered essential for human adaptability and social development and becomes a key factor in the new teaching strategies in higher education. The aim of this paper is to highlight key principles of promoting creativity in architectural design education and to underline a shift in thinking and action.The methodological path goes from theory to practice. The study creates an overview of the existing research concerning the subject and presents a descriptive reading through teaching experiences and observations in the 2nd and 3rd years of design studio instruction.

**Keywords**: Design process, creativity, design education, principles, methods

## 1 INTRODUCTION

The speed of change, a characteristic of the modern world, requires new skills for dealing with constantly changing problems. In this context education must adapt in order to generate professionals capable of facing these challenges. "*Unable to define what we need to know, we have begun to focus on how we will need to know, on the flexibility and openness which characterises creative thinking. Creativity is now seen to be the wellspring of human adaptability and social development*." (Dineen et al., 2005)

Creativity is commonly defined as the introduction of something innovative and positive for society. The study of creativity is characterized by a variety of key questions, such as the nature of the creative process, whether there are multiple types of creativity, the relationship between high levels of creativity and everyday creativity as well as the neural basis of creativity. Across the design disciplines there is no shared understanding about creative processes and, in particular, how they apply to learning and teaching experiences.

## 2 METHODOLOGY

The aim of this paper is to highlight the key principles of improving architectural design education. The methodological path goes from theory to practice. The study creates an overview of the existing research concerning the subject and presents a descriptive reading through teaching experiences and observations in the 2nd and 3rd years of design studio instruction.

For this purpose the research will pursue the following topics:

- investigate theoretically the design process, its distinctive features and its controversies;

- investigate theoretically the concept of creativity, its importance for design and its redefinition according to recent neuropsychological researches;
- investigate the domain of design education and highlight the problems it faces and the priciples that can improve it;
- elaborate teaching methods to follow the principles and illustrate them on teaching practices for the 2nd and 3rd years of study.

## 3 THE DESIGN PROCESS

The process of creation in architecture is subsumed under the broader term of design. The term design refers either to the end product or to the process. In this paper we will be concerned with design as a process.

Design is an important force for innovation and change in past and present societies. Design is considered to be positioned at the intersection between the artistic and scientific practices, but it also shows important features that differentiates it from both areas. In contrast with science, design is concerned with imagining new, improved realities, rather than being limited to analyze and describe existing ones. On the other hand, in contrast with art, design is oriented towards solving real-world problems and intends to fulfill certain functions, while the artistic process is largely self-motivated and is focused on expressing the artist's own thoughts. (Lawson, 2005). Therefore, the existing theory and research concerning the design process are largely based on the assumption that design is a distinct discipline coupled with a distinct mode of thinking and knowing (Lawson, 1997; Cross, 2006). This assumption originates from observations of how design process relates with the concepts of problem space and solution space, where problem space represents a set of requirements and the solution space represents a set of constructs that satisfy these requirements. In problem-solving theory, the problem space incorporates a set of possible states, a set of operations, as well as an evaluation function or stopping criteria for the problem-solving task (e.g. Ernst and Newell, 1969; Newell and Simon, 1972 in Alexiou, 2009 ). The solution space incorporates all those solutions that meet the requirements expressed by the problem space. According to this view, design problems are ill-defined problems, in the sense that the means (i.e. the representation of the problem space and the possible operations upon the problem space), as well as the ends (i.e. the evaluation function or the stopping criteria) are not given in the design task environment but are part of the design process (Simon, 1973; Goel and Pirolli, 1992 in Alexiou, 2009 ). Other researchers talk about the mutual influence between problem and solution in design tasks: while usually problem solving starts from the existence of a defined problem that circumscribes the solution, design involves defining the problem together with the solution (Dorst and Dijkhuis, 1995; Dorst and Cross, 2001 in Alexiou, 2009). For this reason, design problems are often called 'wicked' problems (Rittel and Webber, 1984), a notion that incorporates the idea that such problems are open-ended. Also, they do not have a single, optimal solution and require subjective interpretation and evaluation.

This subjective side was an important theme of debate related to the product design quality assessment and has generated, since the 1960s, a theoretical investigation focused on better understanding the design process, on applying a more scientific approch to it and on developing and adopting design methods. The goal was to improve both the process and the product outcome by reinforcing the decision-making activity in design.

An overview of the literature on the subject should mention contributions from professionals both withinthe domain, and scientists from other fields: eg. Christopher Alexander - „Pattern

Language" (1977), Herbert Simon - „The Science of the Artificial" (1969), Donald Schön - ''The Reflective Practitioner" (1983), a work that contributes to the understanding of design education, Brian Lawson and William J. Mitchell with studies on design thinking. In 1984 Nigel Cross divided the subjects concerning design methods in several areas of study: control over the process is the goal of studies by Christopher Jones and Bruce Archer, the structure of design problems is discussed by Peter Levin, Barry Poyner and Melvin Webber with Horst Rittel, the cognitive aspects of design are studied by Ömer Akin, Bryan Lawson, Jane Darke, John Thomas and John Caroll and the philosophy of design methods is further investigated by Broadbent (1973) and Cross (1984). (Kowaltowski et al. 2010)

The studies showed that the design process in architecture does not follow universal and precise rules and, moreover, methods and knowledge in this area are difficult to obtain since practitioners rarely talk about and describe their thinking process. (Kowaltowski et al. 2010) Also, a formal scientific process cannot be completely implemented since design deals with important concepts such as context, uniqueness, value and it acts under constant changing conditions, that are always incompletely defined. Good designers characteristically have incomplete and possibly conflicting ideas about a situation and allow these ideas to coexist without attempting to resolve them too early in the process. (Lawson, 2005: 154) This is why stating the problem becomes already a step towards solving and this is where creativity may intervene. Creativity enables the designer to perceive a problem from new and unconventional perspectives, subsequently it may stimulate original and quality solutions and is therefore considered a key element in design.

## 4 THE CREATIVE PROCESS

There is, in fact, a rich literature on creativity, exploring the nature of the creative process, whether there are multiple types of creativity, the relationship between high levels of creativity ("BigC") and everyday creativity ("little c"), and the neural basis of creativity. Also, there are multiple studies focusing on methods to improve creativity as human ability and thought process.

From a neuroscience perspective, creativity is defined as the ability to produce work that is both novel (original) and appropriate or useful and which manifests in artistic creation, science (discovery), technology (invention), economy (innovation), etc. A creative product in different domains is measured against the norms of that domain, with its own rules, approaches and conceptions of creativity (Reid and Petocz 2004). However, finding new solutions to individual problems and thinking away from pre-established ideas are all common creative processes in everyday life. According to this point of view, creativity results from a set of mental functions normally found in all humans, but specific conditions and techniques can foster the creative process. Studies on creativity identified some characteristics and conditions that influence this thought process:

1. creativity is correlated with certain traits of the individual: receptiveness, immersion in the problem, dedication and motivation, questioning attitudes, analysis of idea with special attention to flawed solutions (Kneller 1978 in Kowaltowski et al. 2010).

2. creativity is improved by accumulated knowledge or expertise because the capacity to solve problems relies on two cognitive factors: repertoire and systemization of insights.

3. specific conditions, such as well-defined problem limits, existing conflicts, restrictions or challenges help to frame of the problem space and stimulate creative solutions.

4. the creative process is divided into four stages and each stage may be improved using specific methods. The stages are: preparation, incubation, illumination and verification (Kneller 1978 in Kowaltowski et al. 2010 ). Preparation is an investigative phase to become familiar with the problem environment, incubation is often an unconscious process of preparation for finding a solution, illumination occurs when perceptions are restructured and integrated in finding a solution, verification is the stage when ideas are analyzed, evaluated and tested.

5. because in-depth knowledge is important for the creative process, the stimulus for creative solutions is distinct for different domains. For example analogies, mutations or combinations based on specific knowledge and expertise or evaluation of possible design solutions using models and drawings are just two of the possible techniques frequently used for improving creativity in architectural design.

Recent architectural practices display a large variety of methods and philosophies addressing design situations. The architect does not address each new situation as a blank page but through the beliefs, values and attitudes that she has accumulated during his professional development. An architect reaches a particular vision concerning the architectural practice that can be called her "design philosophy". ( Lawson, 2005: 159) This vision evolves over time and generates a set of guiding principles that influences the mental context and the foundation for each design process. Simultaneously, with each design situation the architect evaluates and better understands these principles and ajusts them. The creative vision of the architect projects onto the world a new reality that, imposed on the other, could be dangerous in case it proves to be wrong. Therefore, the key to the positive feature of creativity is the social aspect, namely the recognition by others and adoption as the new status quo. This draws attention to issues of morality and ethics of the profession, with important influence on design education.

## 5 DESIGN EDUCATION

In recent decades universities and architecture schools in particular have made important efforts to improve design education and to keep up with the speed of change and the complex situations in the contemporary world. The goals in elaborating new ways of teaching design are mainly concerned with enriching the pure artistic vision of architecture, through the insertion of scientific knowledge and social responsibility. Also, architectural education must adapt to the everchanging conditions in the present world and to the globalized professional market. These challenges require flexibility and openness, attributes of creative thinking.

However, recent research (Sternberg, 1991, Kowaltowski et al. 2010) shows evidence that higher education seldom adopts practices that favor creativity through new teaching strategies and curriculum design. The available studies concerning creativity and the way it can be promoted in design are not often explicitly applied in a structured pedagogical way.

The architectural design education usually has at its core the studio system and depends mostly on the personalities of the instructors and their individual ways of approaching design. Project-based learning has been adopted as the key teaching–learning strategy by most universities. The studio teaching method relies mainly on the interaction of students with experienced professionals and on unstructured discussions concerning the design problems raised (Kowaltowski et al. 2006). This method requires, within the existing conditions, a critical evaluation and perhaps a shift in thinking and action.

First, several studies identified problems in architectural education relating to the means of communicating and assessing ideas, and talked about emphasizing the artistic content to the detriment of other perspectives, such as the social or environmental ones. This is also due to the fact that most publications that come in contact with the education field reinforce the aesthetic or formal bias. This requires making a distinction between originality and creativity in design. Being creative in design is not purely or even necessarily a matter of being original. (Lawson, 2005: 153) The original appearance of the architectural product should not be valued without a critical appreciation of the way it fulfils the demands placed on it. Good design results from "unexpectedly relevant solution not wackiness parading as originality". (Lawson 2005).

Secondly, the increased complexity in the design world forces innovation, originality and the stimulus for creative thought to no longer rely on talent or chance alone. Especially when creativity is not just a gift, as neuropsychological research studies have already begun to prove, but a potential existing in every human being and that can be promoted in a stimulating environment. Architectural education must adopt "*an approach in which all aspects of teaching and learning adhere to basic principles for fostering creativity. These involve […] not only intellectual, but also personal, motivational, emotional and social aspects of creativity […] children need contact with complexity, ambiguity, puzzling experiences, uncertainty and imperfection*." (Cropley, 1997) This requires a student-centered approach, in opposition to the traditional teacher-centered approach to learning. The student-centered approach values problem-based learning and student's capacity to find a personal route towards the answer. It starts from the observation that in design there isn't only one correct answer but more, thus encouraging students to explore with their own means, to use investigative work and inventiveness. Therefore, the teacher, instead of offering a solution through his own approach as model, becomes a facilitator for learning and a supporter of the students' own effort. The emphasis is no longer only on the final product but also on the process, not only on problem solving but also on problem definition.

Thirdly, since design produces future situations, the studio within the architectural school should not limit itself to transfer existing knowledge, but it must be understood as a research center, a laboratory of experimental testing in wich students and teachers toghether ask questions and try to find answers. It must get closer to other fields and disciplines that can provide information to widen our field of understanding. Multidisciplinary approach, as a means to get in contact with different ways of thinking and acting, may become a valuable tool in promoting creativity.

## 6 PRINCIPLES OF PROMOTING CREATIVITY IN ARCHITECTURAL DESIGN EDUCATION

Corroborating the observations developed in the previous chapters we can generate a list of principles that should be used for improving architectural design education in the studio:

- shifting from *what* we need to know on *how* we need to know;
- moving away from a teacher-centered approach towards a student-centered approach;
- moving away from assesing the final product to assesing the process leading to it;
- accentuating problem definition as much as problem solving;
- accentuating the individual investigative work and the "freshness of perception";
- promoting questioning attitudes and critical thinking;

- facilitating the accumulation of knowledge and experience that become points of reference;
- promoting specific conditions (eg. existing conflicts, restrictions or challenges) in the teaching objectives;
- facilitating the contact with different ways of thinking and acting
- promoting multidisciplinarity
- promoting the studio as a research team and not just an individual place for learning

These principles require new methods of theaching in the architectural design studio.

## 7 CASE STUDIES

This chapter builds upon the author's teaching experiences and observations in the 2nd and 3rd years of design studio instruction, Basics of Architectural Design Department, University of Architecture and Urbansim "Ion Mincu" in Bucharest (UAUIM), in the last 7 years.
Following the principles previously outlined, a number of methods were developed in the studio in connection with the university curricula. The Basics of Architectural Design Department UAUIM, which guides students' studio education during the 2nd and 3rd years of study, is composed of 12 studios for each year, each studio coordinating the activity of a group of students for two consecutive years. In the period 2008-2015 (four generations of students) the department developed two thematic systems with an inflection point in 2012. Prior to this year the thematic structure for the 2nd and 3rd years of study was first and foremost concerned with the study of given architectural programs and was divided into two "long" projects and two "short" projects. The "long" projects (8/9 weeks) started from a general brief, a given architectural program (or typology) and a site, for all the studios and attending students. The "short" projects (5/6 weeks) allowed diversification between the studios both by choosing different destinations within a given programmatic group and by allowing different and interesting sites that implicitly brought in discussion the place. After 2012 the topics for the 2nd and 3rd years of study became oriented manifestly to the investigation of place. The studio projects were eliminated, working just with general briefs that intented to impose a critical analyse of the subject of study, as well as to promote and debate the different teaching visions within the department.
In this context several methods were developed in our studio for promoting the principles stated in the previous chapter.

1. open and integrated study briefs

Following the department curricula in the 2088-2012 period, our studio aimed to facilitate a complex understanding of the topics brought into question and to promote critical thinking by deepening the study of the place/ subject and debating it over several projects. (eg. Gellu Naum cultural center, Comana, Romania, 3nd Year, 2009-2010). Another instrument for accentuating individual investigative work and personal learning process was not giving a precise site for the intervention; each student identifying a place after a first research phase (eg. Construction and materiality, Campulung Muscel, Romania, 2nd Year, 2012-2013, Construction and materiality, Tiganesti Monastery, Romania, 2nd Year, 2014-2015).

2. theoretical research and analysis of design precedents

During each project students were asked to elaborate a study on relevant topics connected with the subject or to make in-depth analytical analysis of design precedents, both aiming to build the knowledge and experience which would become points of reference. Students are

requested to analyze relevant given examples of architecture, illustrating various ways to respond to a particular places and different context constraints. The study requires a deep understanding of the existing project and a detailed explanation, centered on contextual, compositional, sensorial and symbolic issues. The assignment is elaborated individually or in teams of 2 students and the visual means of representation (scale models, drawings, PechaKucha) are chosen by the teachers, depending on the qualities of the examples and the learning objectives.

3. Interdisciplinary debates

Interdisciplinary lectures by guest speakers from other fields (anthropologists, writers, historians, planners, specialists in PR, education, cultural studies, engineers etc.) provided specific information or methodological guidance for gathering information. These interdisciplinary discussions helped students to make contact with different thinking patterns and to better understand complex situations.

4. alternating individual and collective debates

During the study process debates with teachers from other years of study were facilitated. The aim was to maintain a high tone throughout the project, to help students learn to argue and explain their personal approach in a concise and convincing way, to get them in contact with ideas and opinions from outside the teaching team and to promote critical thinking.

5. individual process

Students were encouraged to keep a journal of study documenting all the intermediate steps to complete the project (photographs after study models, drawings, notes) and to deliver it together with the final phase. Also, they were encouraged to give a title/ motto that best described their personal endeavor.

6. Exhibitions / events

For certain study subjects, exhibitions outside UAUIM were organized (e.g. Cărtureşti, Campulung) in order to disseminate the results of the study and to present the studio's approach. Each student elaborated a panel and a model to synthesize one's personal track. This helped promote the studio as a research laboratory and build a team. Also, study trips of one or two days were organized, either to the sites or to places of interest for the subject. These trips provided opportunities for launching debates in a less formal environment, launching a collective investigation and, at the same time, for encouraging personal impressions.

7. teaching schedule

At the beginning of each project a teaching schedule was given to assist with the organization of teaching, to trace important stages of the study, to inform about the events that take place in the studio and to plan the exercises along the way. This program helped coordinate the collective activities (site analysis, site models at different scales), and to better control the teaching methods.

## 8 CONCLUSIONS

Our study highlights the importance of creativity in design in the framework of the contemporary and future society and investigates the redefinition of the concept according to recent neuropsychological researches. It signals a shift in the understanding of creativity not as a gift but as a potential that can be cultivated in every individual. Also, it makes a critical evaluation of the design process in practice and education and argues for the necessity of new

principles of thinking and action. This research paper develops methods to follow these principles and illustrates them on teaching practices for the 2nd and 3rd years of study from a period of 7 years. These methods are being used mainly in an informal and still unstructured manner. This research also highlights some of the issues that should be debated in the architectural education environment and should come to the forefront in the curriculum discussions. A necessary step would consist in testing these issues in relation to their efficiency in improving skills and in generating better design solutions.

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# CONQUERING SPACE:
# EXPERIMENTS IN ARCHITECTURAL EDUCATION

**Miljana Zeković[1], Dragana Konstantinović[2], Višnja Žugić[3]**

*[1]University of Novi Sad (SERBIA)*
*[2]University of Novi Sad (SERBIA)*
*[3]University of Novi Sad (SERBIA)*
*miljana_z@uns.ac.rs, konstan_d@uns.ac.rs, visnja.zugic@uns.ac.rs*

**Abstract**

This paper analyses three levels of change in *understanding space*, *spatial concept* and *spatial design process* applied directly through Architectural Design and Ephemeral Architecture courses at the 3rd year of the BA programme in Architecture[i]. These levels of change are presented through three distinct but mutually supportive and complementary methods/strategies, applied in architectural design education in several projects featured in the aforementioned courses. The first one on the list is *the Embodied Narrative.* Taken directly from Bernard Tschumi, this method enabled students to develop their imaginative skills and creatively respond to request of capturing the ambience of the written text, followed by design of physical spatial models (maquettes). During 2014, students investigated possibilities of applying this method in a project based on some of the most influential manifests written by architects in the 20-th century, translating rather abstract text input to more or less realistic spatial frames. The second level of change was realised through a two-year project (2012-2013) *'Spatial Memory: Delayering'* realised with Ephemeral Architecture course students. By investigating a number of essential questions - Can space remember? What is the influence of memory layers on *genius loci*? Can we 'delayer' this memory and by which means? Can both real and imagined stories influence this phenomenon of spatial memory? - students discovered new spatial potentials and acquired an advanced approach to investigating space. The third method came from the 'fundamentally performative nature of architecture' [1] and the theoretical platform of 'Beyond' [2] - a spatial design project clearly glorifying *Process vs. Artefact*, created and proposed as an answer to the Venice Biennale of Architecture calls for participating countries in 2014.

In conclusion, this paper emphasises the importance of the results of the applied methods and strategies in architectural design process and their significance in students' further education. Arguing that it is not about the 'buildability' of design, but rather about truly conquering the idea of belonging to space, we ask for further rethinking of methodologies in architectural education.

**Keywords**: architectural education, spatial design, experiment, research, Delayering.

## 1 PROJECT BACKGROUND

Approximately ten years ago, moved by two major issues - on one side, a constant decline in quality of our architecture students' projects, and the urge for change in the conventional educational system, on the other - our team of professors and assistants gathered around the Architectural design studio[ii] made a substantial effort in radical rethinking of the education that we provided - its purposes, its aims and its tangible and intangible outcomes. As a result of a thorough debate on potentially better architectural design education concepts, we made a

theoretically strict platform that supported *Process* against *Artefact* (Product). The main idea was to instruct students *to learn to think about space* rather than *to learn to formally design it*, to put emphasis on spatial concept development and design process itself. Leaning onto promising architectural manifests of the moment, we embraced the idea of the essential need for discovering 'architecture beyond buildings' [3] through experiments on all potentially achievable levels and innovations rooted in a wider multidisciplinary field.

As it was expected and foreseen from the analytical base of our new approach, we had to be patient, persistent and optimistic while waiting for the first results. The organisational structure of design studios was not helpful either. It was not possible to persuade colleague professors to join us in this drastically different approach, so we could not establish the 'horizontal linkage'. Had it been realised, such a linkage would probably speed up the whole process, since a horizontal connection would mean that all professors from all design fields teaching the same year's students perform the so called 'new approach'. Instead, we had to define the 'vertical channel'. This meant that the three of us, together with a very few willing colleagues, made a list of all courses we were teaching at the time, both obligatory and elective, and structured a channel from the first to the last year of study, in order to facilitate consistency through a constant upgrade of once established knowledge base. However, this was quite a heavy task, since it was challenging enough to maintain the students' attention and interest throughout the years, at the same time facing diverse and sometimes opposing sensibilities of involved professors. With time, we even managed to stabilise a small-scale 'horizontal link'. This link is still active and dynamic, achieved with 3rd year students of obligatory courses Architectural Design 1 and Architectural Design 2, Ephemeral Architecture elective course and extracurricular activities realised through students' involvement in architectural contests and exhibition installations. Results of this creative 'linkage' are the very subject of this paper and will be presented and discussed further in the text.

## 2 THE ARCHITECTURAL MANIFESTO PROJECT

Driven by the essential necessity of the architectural concept understanding and development, we tried to get to the core of the issue through the *'Architectural Manifesto'* project. This project was realised with the 3rd year students, during the 1st semester 2014/15 Architectural Design 1 course.

Tschumi's teaching achievements were the ultimate inspiration while taking the *embodied narrative method* as a constructive starting point for the first time, a few years ago. Struggling with students' understanding and development of the concept in architectural design, we embraced a profound thought of 'trying to get out of architecture, which is always determined by a programme' [4]. Tschumi's elaboration of the 'device' he used for this purpose went further than simple logic:

> *Why not give students a short story which already hints at the making of spaces but without being literal about it?[...], and the students were to try and invent a building based on their interpretation of the story. It was interesting because it was allowing us to avoid the preconceived ideas of what a building should look like. We were simply trying to deal specifically with what architecture is supposed to be - space and use, space and its experience. [...], concept and experience is what makes architecture.* [5].

We embraced this approach as it was loaded with potential in the domain of creative thinking and decided it was worth a risk to introduce this method as an experiment on concept development in our course. Taking the *narrative embodiment method* to the next level, we tried not to evade the spatial determinants of the narrative, but to capture the philosophical core of famous architectural manifests, translating them into more or less abstract spatial attitudes. These texts ranged from *Betsky's 'Architecture Beyond Building', Schulze-Fielitz's 'The Space City', Pichler and Hollein's 'Absolute Architecture', Constant's 'New Babylon'* to *Kahn's 'Order is'* and the *International Manifest of the Situationists* [6]. Although analyses implied direct spatial input in each of the texts, our models went further into personal interpretation of influential factors that led to their creation. Issues of architectural and dramatic, real and imaginary, inner and outer spaces, and, additionally, spaces of one's personality, intentions and attitudes formed the base for conceptual creation of *physical models of thoughts* (maquettes).

Strictly focused on individual approach in dealing with students' interpretations of the selected texts, we made conscious effort not to influence their notions of the subject or impose *a priori* concepts. Concepts of diverse spatial perspectives came into spotlight where we hardly expected them, making the concluding interpretation of their work even more interesting. The best students' projects could be clearly divided into five distinct categories based on their overall spatial character: dominant space, interactive space, flexible space, monumental space and scenic space. Each of the presented spatial types had higher qualities incorporated inside. These qualities were in ranging from constituting a microcosm, through establishment of spatial situations and spatial negative, to the theatrical concept of a typical dramatic space. Dominantly influenced by specific textual-catch in selected architectural manifests, students responded to them through articulation of spatial gestures, posture of spatial attitudes and, moved by aesthetical or functional ideals, they accomplished a dynamic 'alive space' creation. Table 1 gives a comparative overview of achieved spatial types, higher qualities and dominant spatial influences regarding students' works in the '*Architectural Manifesto'* project.

| | **Space type** | **Achieved Quality** | **Dominant influence** |
|---|---|---|---|
| | | | |
| **I** | Dominant space | Microcosm creation | Spatial gesture |
| | | | Structural attitude |
| **II** | Interactive space | Alive space creation | Aesthetical guidelines |
| | | | Functional guidelines |
| **III** | Flexible space | Spatial situation creation | Unexpected change |
| **IV** | Monumental space | Spatial negative creation | Built-unbuilt relation |
| **V** | Scenic space | Dramatic space creation | Theatrical ambience |

Table 1: Achieved complex qualities in students' works as a result of the narrative embodiment method application

## 3 DELAYERING

Contemporary emphasis on Space as *a subject* rather than a mere *envelope/framework* of an action/happening/event is commonplace in architectural education and, above all, in the conceptualisation phase of students' projects. One of the ways to achieve this is through interdisciplinary methods and strategies our spatial research is based on. The main goal is to achieve a better understanding of *space as a phenomenon*, which would eventually lead to further development of superior project ideas, closer to the essence of *genius loci*. However, this is a two-way process – while adopting, for instance, a theatre/performance methodology,

architecture students begin to act as performers themselves, successively developing their creative potentials. Indicating the ascending significance of performance in a wider field of social sciences and the arts, Michael Shanks defines fundamental questions for the development of new strategies[iii]:

> *If Schechner's definition of performance as 'organised human behaviour presented before witnesses' still holds, then the pertinent question will be: How is it organised? What constitutes behaviour? How is it presented? What is the relationship with witnesses? We aim to develop a series of 'principle of practice' - approaches to conception, design, rehearsal and manifestation, a continuum of strategies and procedures which attend, with various degrees of rigour, to questions of real-time presentation and representation. [7]*

In an attempt to answer the question of visible, possible and hidden potentials of a specific space/site/location leading to its better artistic interpretation, we developed what is called a '**Delayering method**'[iv] in spatial design, practically introduced through 'The Backyard' project.

'The Backyard' is a site-specific project realised in June 2012 with students of Ephemeral Architecture course for the purposes of 39th International Festival of Alternative and New Theatre (INFANT) in Novi Sad. The main aim of this project was to actualise the problem of the abandoned and devastated open stage of the city's Cultural Centre situated in the backyard of the building, in the old core of the city. The idea of revitalising this specific space was realised through two-phase workshop that involved 29 students of architecture, resulting in provocative ephemeral transformations that included screening of students' video projects about this space, multimedia installations, hosting of lectures and discussions, as well as INFANT's official programme. During the interval of 9 days, these activities turned the Cultural Centre's Summer Stage into a Meeting point of the Festival and the City. The essence of this project lied in empowering the students to detect, define and conquer spatial potentials they had not been consciously aware of. To achieve this, we defined a hybrid system of methods that work together neatly: *Method of loci*, as a well-known technique for memorising specific spatial qualities by active and dynamic usage of participants' imagination skills. *Delayering*, as an advanced technique firmly based on issues of *spatial memory, memory layers, ambience, de-reconstruction potential* and *spatial qualities*. United in this hybrid system, these methods together with utilisation of theatre/performance methodology, provided a unique recognition of the given space, leaving it marked with a new layer of meaning.[v]

### 3.1 Methodology

The same logic that led Juliet Rufford to differentiate between 'delimitation and definition of site-specificity' and the distinct work that 'asks what performance that, in some way, responds to a particular site *does*, how it achieves its effects, and to what purpose' [8], led us in defining the hybrid method used in realisation of 'The Backyard'. We were not interested in providing a work which would only formally be regarded as *site-specific*. Our aim was to get to the core of what kind of concrete work this location yearned for. We managed this by 'digging deeper' than the surface, the facts and limitations. During the creative process of rethinking the space, we created a structure of spatial values incorporated in the final work by adding one layer at a time.

Layer 1 - *Genius loci* - as Michael McKinnie defines three most common allegories used in site-specific practice as heterotopic, dialogic and spectral [9], *genius loci* is, in our opinion, a medium of pure dialog between the space and the human. It is directly through *genius loci* that the site communicates; facts merged in this quality are like a silent monologue waiting to

be answered to. That is why we consider this layer as a call for dialogue. During this phase, the students' task was to physically and spiritually relate to the site through a set of physical exercises, understanding of shapes, geometries and acquiring the ambience of the considered space.

Layer 2 - *The story construct* - 'self-consciously mixing of actual and imaginary places into play at the same time' or in McKinnie's direct interpretation - the 'heterotopic trope' [10] describes the second layer in our practical constellation. Students were asked to find all the existing historical, geographical and sociological attributes of the space and to imagine new ones - ones, that were more conceivable or others, consequential to creatively interpreted spatial inputs.

Layer 3 - *Grasped potentials* - the next layer added to the space were stories developed as a mixture of real and imaginary spatial inputs defined in the previous phase. This process was particularly important because the level of creative understanding of existing and fabricated facts/stories varied between teams. Their unique, previously untold stories were recorded as short amateur video projects. This layer's activities could be classified as what is defined as 'spectral' [11].

Layer 4 - *Programme* - this layer introduced the given programme for this spatial spot. This programme was defined by the INFANT festival from the very beginning of our work, but we decided not to reveal it until the unconditional quality dialogue had been established between the space and students. The programme was easily handled because this new input just added value to the created spatial framework.

Layer 5 - *Site-specific installations/performances* - final instalments came as well in a string of a nine-days constant activity at the Summer Stage. Used as a lounge where 'the Festival meets the City', this forgotten city space lived to its complete though ephemeral revitalisation through a set of students' actions - starting with public screening of their video-projects, through temporary installations - as was the 'ivy-specific wall', lighting installations and spatial reconfiguration and a complete staging of the space, to performances held there, covering a wide range of serious topics (as was 'What is Ephemeral Architecture' *speed dating* performance) and light creative experiments (as was the 'Shadow party' performance).

As an applied method, *Delayering* should be observed from the analytical point of view, *after* particular events (introduced through 'layers') happen in a particular space. Here we may agree with Vladan Perić's understanding of the spatial dramaturgy as 'a process of mutual transformation of meanings between space and an event that takes palace in it', leading further to the constitution of the 'ephemeral chronotope' [12]. The entire process of *delayering* is led on behalf of this specific dramaturgy development. Once the space is marked by an event - it can never be the same again. It grows heavier from a new layer of meaning. The *Delayering method* precisely benefits perception of all active factors contributing to production of the new context.

## 4 RE: LOAD[vi]

When Rem Koolhaas[vii] titled the 2014 Venice Biennale exhibition 'Fundamentals', offering a Biennale dedicated to 'Architecture, not Architects'[viii], and furthermore - 'Absorbing Modernity: 1914-2014' thematic call for the participating countries, we agreed to step forward with an advanced level of practice of previously defined *Process vs. Artefact* method. The idea was to offer a real-time process observation in the National Pavilion of Serbia. Delayering of Koolhaas' topic resulted in defining the crucial questions our project was based

on: What is the basis? What is fundamental? Do we have anything to go back to? Which particular basis are we rolling back to? [13] Further understanding of the basic questions led us to presume that we do have a marginalised healthy base - a trace of a half-realised utopia of the New Belgrade plan form 1967[ix] - and that we should try to reconquer that fantasy through reactivating the memory of the space and taking an active attitude towards the brightest examples of Serbian architectural/urbanistic practice between 1945 and 1980. Understanding, before it was even written by Edwin Heathcote, that this was 'a biennale of stories. Not of monuments, not of proposals and not of the kind of idealism that might once have characterised modernism.' [14], we were positive that only a *live process* could answer the *fundamental question*. The process was anticipated through four stages, and the following description of work packages highlights their essence:

Stage 1 - *Compression* - After a comprehensive research and collection of the 'quality (un)built narratives', we summarise all examples in one publication: 'Fundamental - the Utopia Design Manual'. This publication, composed of relevant professionals' textual contributions, graphic documentation and historical displays, is further used as THE BASE for project realisation.

Stage 2 - *Dissemination* - At this stage we distribute the Manual to all architectural faculties in Serbia and ask for their participation in the Venetian process. The total number of teams from these faculties was planned to be 14, thus fulfilling 14 weeks of the exhibition duration.

Stage 3/1 - *The Pavilion Process* - The Venetian realisation relies on the instalment of the Architectural Design Studio in the Serbian Pavilion. 14 architectural teams occupy this space in a team-per-week dynamics, during which they are focused on their own projects of the Unbuilt Utopias based on the Manual. Graphic documentation, drawings, models, maquettes, photo-essays are produced at this stage. Every team is supposed to base its own Utopia starting from scratch, or leaning onto spatial evidence previous teams leave behind.

Stage 3/2 - *Documentation* - The entire process in the Pavilion space is being documented on so called 'live wall' - a complex diagram occupying the walls, subject to constant everyday changes. This wall is anticipated as a creative tool for analytical comparison of proposed projects, as well as representation of the creative trace of the process in its entirety.

Stage 3/3 - *Parallel* - Additional contribution to this project is enabled by the on-line distribution of the Manual and an open call for all interested parties to provide individual contributions in form of drawings/videos uploaded to the RE:LOAD web portal.

Stage 4 - *Aftermath* - The entire 2014 Biennale exhibition period is to happen in a 24 weeks timeframe. Following the 14 weeks of activities in the Architectural Design Studio in the Pavilion, 'the final' spatial construct is to remain as a spatial installation for several more weeks.

Since 'space, conceived as four-dimensional (space-time) is made up of events' and the process-based proposal thus represents 'interpretation of architecture as an event area, not as an object for observation' [15], we aimed to avoid 'emptied, simplified and thus more manipulable' spatial readings [16] by giving preference to social over physical space. Further concerned with the idea of the simple understanding of architecture as a visual art, Radivoje Dinulović concludes with question: 'not how, but why do we bother with architecture as an art at all?'[x] Slightly shifting from this attitude in our point of view, we embrace the equality of the 'utilitarian' and the 'visual', insisting on pervasive relations of the 'visual' outcome and its programme-based processes.

## 5 LOOKING FURTHER

Reexamination of the architectural pedagogies is an overall trend in architectural education. As long as we insist on an open system of values in this domain, we are safe from hermetically sealed boxes of the same instruments/tools that predominantly lead to same results and stagnation. Our research, based on radical rethinking of methodologies and strategies development and application through experiments in architectural education, contributed significantly to progress in understanding space. The applied *Embodied narrative* method, alongside complex strategies of *Delayering* and *Process vs. Artefact*, have facilitated advancement in creative thinking and development of further interest among students in active search for new spatial answers.

The very idea of the architecture/space performativity and an overlapping of performance methodologies and spatial design endeavours is marked as an efficient system of achieving a specific advanced perspective on this subject. Understanding Space as a protagonist of Action 'imposes the idea of architecture as a paratheatrical phenomenon.' [17] This statement leads into further experimental practices and transdisciplinary research referring to an alive, dynamic *locus*, rather than a lifeless spatial spot, as well as to a certain softening of boundary between the space and the human. This phenomenon of overlapping pedagogies may be identified in different architectural education studies in which students are encouraged to 'develop design strategies which 'dramatise' experience, beginning to explore the expressive potential of space, and grasp the affective effects as concrete spatial condition' [18]. Moreover, Beth Weinstein emphasises the necessity of finding a solid ground for:

> *..., negotiating the gap between definitions of performance and clarifying how and when we can turn our attention, during different moments in the architectural design process and academic explorations, towards performance as content and method,..., and the feedback loop of learning we gain through these embodied spatial practices. [19]*

To conclude, going back to Tschumi's core value statement that 'concept and experience is what makes architecture', indicates that we have to work hard to provide new methods and strategies for creative concept development and profound understanding of all correlating disciplines in active search for the ultimate experience. Arguing that architecture that embodies human ambition towards achievement of a full spatial experience 'needs to be unpolished, incomplete and receptive for new layers of meaning' [20] we may conclude that genuine conquering of space needs to be attained through carefully selected and applied methodologies that will eventually lead to creation of these layers.

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# SPATIAL DESIGNERS AS ENGAGED POLITICAL ACTORS

**Ileana Apostol**

*ETH Zurich (SWITZERLAND)*
*ileana@nethood.org*

**Abstract**

To revive the significance of spatial design within the contemporary production of urban space, I argue in favour of active and informed engagement of spatial designers into the political life of the city. For that I give two recent examples of effective political action: one regarding the Belgrade Waterfront project proposal, which is at the beginning of initiating a participatory process for urban development matters in Serbia, and another more established one, for the redevelopment of Santa Monica Place in California. These two cases led to an elaborate theoretical inquiry on the current struggles for the right to the city, and on the role of design practitioners in the civic life of a place, including creative experiments of mediating between the various powers involved in urban development.

**Keywords**: right to the city, engagement, participation, spatial appropriation, the stranger.

## 1 INTRODUCTION

In this paper I advance three main ideas with respect to the role of spatial designers (i.e. architects, urban designers and spatial planners) in providing contemporary citizens the right to the city. In particular I address the ongoing struggle for the rights to difference, participation and spatial appropriation, in light of the dialectical tension within the practitioner's (re-)quest between repetition and specificity. I illustrate this tension with two stories of political action regarding spatial development in Belgrade, Serbia, and in Santa Monica, California. My choice for these two cases has various facets. On the one hand, in both cases I have witnessed events within the ongoing public debates and development contestations, and have followed their unfolding processes in which architects and spatial designers play an important role. On the other hand, the implementation manners of these development projects were discussed in two extremely different planning and development cultures, given not only their specific perspective on urban policy, but also the various degrees of experience with participatory processes. In any case, they show intriguing positions of spatial designers as engaged political actors, and therefore, I provide extensive space in this paper to describe them.

Such processes, nevertheless, stimulate complex theoretical explorations, and in the following narrative I build an argument in favour of reviving the societal impact of spatial design professions through close examination of the role that spatial designers play in the political life of the city. First, to advance an agenda for action I draw on Donald Schön's view of the reflective practitioner [1], who adjusts the process to engage with and react to particular circumstances. Second, I suggest that an emerging role of spatial designers in local communities may be understood in the mirror of Georg Simmel's social type of the stranger [2], the potential wanderer, who is at the same time a member of the group and an outsider expected to confront it. Furthermore, as a third strand of thought, I propose the exercise of a mediating role of designers between the expert knowledge and creativity, and local knowledge and the spatial practice of a society.

## 2 ILLUSTRATIONS OF THE ARGUMENT

*Abstract space (or those for whom it is a tool) makes the relationship between repetition and difference a more antagonistic one. As we have seen, this space relies on the repetitive - on exchange and interchangeability, on reproducibility, on homogeneity. It reduces differences to induced differences: that is, to differences internally acceptable to a set of 'systems' which are planned as such, prefabricated as such - and which as such are completely redundant.* […] *Differences endure or arise on the margins of the homogenized realm, either in the form of resistances or in the form of externalities (lateral, heterotopical, heterological). What is different is, to begin with, what is excluded* [3](p.395, p.373).

### 2.1 Belgrade on Water

As I am writing these lines, on March 6, 2015, the Serbian Academy of Architecture warned the Serbian government and the City's authorities to be "most directly responsible for the chaos" that could arise soon in Belgrade, if the implementation of the project "Belgrade on Water" would continue [4]. The 2,500 architects and urbanists based in the Serbian capital assert that are humiliated by the fact that, instead of the Urban General Plan, an anonymous scale model has become the main guiding matrix for urban development of the most valuable part of the city -the Waterfront of the Sava River-, showing critical restructuring of a large part of the city centre and implying the demolition of Savamala, a historic neighbourhood.

On June 27, 2014, the Serbian Prime Minister Aleksandar Vucic showed for the first time the Belgrade on Water Project, a $3 Billion megaproject plan for the city redevelopment. Without any public consultation, citizens were presented with a ready-made generic design to be developed by a Gulf real estate development company, Eagle Hills, led by Mohamed Alabbar, the chairman of another major Dubai-based real estate firm by the name of Emaar Properties. At the time of unveiling the model of this plan, I was in Belgrade visiting the Savamala neighbourhood as part of the annual INURA Conference.

The INURA 2014 Annual Conference that took place in Belgrade had the topic "Between Big Ideas and Life's Realities" [5], with the premise that a city's development is inseparable from the life of the people inhabiting it. The urban realities are understood in a dialectical manner as produced in between ambitious visions of a future society and the struggle for the everyday life, between the neoliberal expansion following the interests of capital, and a variety of local resistance practices and social alternatives that attempt to achieve more equitable social relations.

Iva Cukic is an architect, activist and co-founder of the Belgrade-based collective called Ministry of Space (Ministarstvo prostora) that organized the 2014 INURA conference. She graduated from the School of Architecture in Belgrade, and after working as an architect in architectural design practice she understood the huge gap between the custom-designed projects, which mostly addressed a very narrow population range in post-war Serbia, and the necessities of the everyday life. So she followed her feelings and main interests for socially engaged campaigns, and thus ended up spending most of her time in the organization of social and cultural actions in the city. Iva made the decision to start together with other three friends a Belgrade-based activist group through which to address the urban struggle of ordinary people, of those disempowered and those without a voice. In urban activism and research, Iva draws practical wisdom and theoretical knowledge from her background in architecture, art and urban studies.

At the INURA Conference the Ministry of Space organized the first public event regarding the Belgrade on Water project. At that time, the representatives of the Association of Serbian

Architects were not ready to take a clear public position with respect to the parachuted megaproject. As a consequence of the informative debate during the public event, fifty international members of the INURA network, spatial designers and activists among them, signed an open letter to the people of Belgrade, in which they explained their understanding of the situation, they were appreciative, for instance, of the efforts to connect through urban design the waterfront with the city core, but also communicated "some serious concerns about the current proposal" [6]. Among these concerns, at the top were the high economic risks, by giving the entire project to a single investor, and the low financial gains, considering the potential value of the land along the Sava River and the "little exercise of leverage for public benefit." Nevertheless, "cutting-edge practices and outcomes" would have been taking into account the environmental consequences together with the engagement of local knowledge from local communities, which not only would have "substantially improved" the project outcomes, but would have "received a particular legitimacy from this process" by being "locally owned".

Since the last summer, and "despite the fanfare from the government and developer, the project has received a sceptical response from many in Belgrade, including architects and civil society organisations, who question the BW's [Belgrade Waterfront] conception, a lack of consultation and a master plan out of context with the city's history, needs and topography" [7]. The contestation process continues as the Belgrade citizens are acquiring more information on the subject of urban development, due to the designers-activists, and gaining experience by being invited to public debates within civil society groups. They are living the beginnings of a long process of claiming the right to the city toward spatial appropriation.

> *Appropriation itself implies time (or times), rhythm (or rhythms) symbols and a practice. The more space is functionalized – the more completely it falls under the sway of those 'agents' that have manipulated it so as to render it unifunctional – the less susceptible it becomes to appropriation. Why? Because in this way it is removed from the sphere of lived time, from the time of its 'users', which is a diverse and complex time* [3](p.356).
>
> *Like all products, like space, time divides and splits itself into use and use-value on the one hand, and exchange and exchange-value on the other. On the one hand it is sold and on the other it is lived* [8](p.73). *Furthermore, the ludic in its fullest sense of theater, sport, games of all sorts, fairs, more than any other activity restores the sense of the 'oeuvre' conferred by art and philosophy and prioritizes time over space, appropriation over domination"* [9](p.19).

### 2.2 Santa Monica Place

A decade ago, in January 2005, I attended a meeting of the Westside Urban Forum, a gathering of spatial designers, media representatives and citizen-activists, located or interested in the urban issues of West Los Angeles. The invitation to the event says: "Once the keystone of Downtown Santa Monica's revival, the Santa Monica Place mall now sits in the shadows of the Third Street Promenade. But the 1970s-era indoor centre's owners have big plans to radically change its shape and uses, opening it to the sky, extending Third Street through to Colorado, adding 21-story residential towers and building green space on the remaining 2.1 acres of rooftop space. Please join the Westside Urban Forum for an in-depth conversation on this project and what it means to the future of Downtown Santa Monica. Will the plans for Santa Monica Place, in whatever form they are finally approved, finally fulfil the site's original promise to connect the Civic Center, the Bayside District and the Pier? How will a new fully-private stretch of Third Street function differently than the public stretch of the Promenade? And what are the implications of street retail and green space becoming more and more the sole province of private developers?" [10].

The indoor shopping mall Santa Monica Place anchors at its southern end the pedestrian main street in Santa Monica, the Third Street Promenade. The mall was built in 1980 through the consolidation of a mega block over the Third Street, and thus blocking the coherence of the urban public space. At the time, the City of Santa Monica transferred from the public to the private domain one block of the Third Street between Broadway and Colorado Avenue, and in 2005 was interested to review this past measure, and reopen this block of the Third Street for public use.

In the middle of the 2000s the revenues from the commercial activities in the Santa Monica Place mall were not satisfactory, thus the owner and management firm Macerich Company advanced to the City of Santa Monica a remodelling plan. The City considered this initiative as an opportunity to create a coherent link between the Third Street Promenade and the renewed civic centre of Santa Monica. Hence the remodelling of the Santa Monica Place brought to the fore questions regarding property ownership and the use of public space, within a broader development process in which the city of Santa Monica faces the challenge of how to address collectively the individual preferences of a multicultural community.

As it is written in the invitation to the public debate above, however, the developer proposed four towers 21-story towers and promised to offer rooftop gardens as publicly open green areas in return to the community. Thus the debate at the Westside Urban Forum in January 2005 revolved around various conflictual interests of the various stakeholders in the project namely the citizens of the Santa Monica community, the public authority, the developer, and the media. One of the main contradictions was between the image that the City of Santa Monica is projecting to the world, as a civic example of democracy at work, and the image that the developer intended to produce for his development to make 'economic sense' by building four residential towers. In addition, the 'green spaces' that the project promised in turn were proved not to bring any additional value, considering the existing green surfaces and an excellent public park that the City of Santa Monica has along the waterfront. At this public debate, the developer, the mayor and various representatives of the media have been in a very constructive dialogue, which was one among many deliberations in the process of spatial production. Santa Monica Place was redeveloped with an open-air central space on the traces of the former public street, and so today it contributes to a more coherent urban fabric. The residential towers have not been constructed. Next I provide a bit more background to this deliberative context of urban development [11] (pp.151-156, p.171).

The community of Santa Monica in California is an example of high quality urban life, mainly due to active politicians and the civic sense and awareness of its residents. Looking only at its pedestrian-friendly streets, public life appears to be similar to that of European cities, but the process of achieving it conforms to contemporary urban development in the US: public initiative coordinated with private interest. The pro-business collective ideology promotes free enterprise and reliance on complex legal rules. That is the framework of the production of its main open space, the Third Street Promenade. Only after the local government adopted a proactive investment-attractive policy for revitalization, this setting became a gathering place for tourists, local community, and visiting public from the region. The Third Street Promenade is a distinctive enterprise relatively to other developments within Los Angeles' immediate surroundings, due to its capability to bring together local specificities and global influences. The development proves to be very successful as a shopping and entertainment district in the heart of downtown, and its success includes both economic and civic aspects.

In downtown Santa Monica, the transformation of three blocks of the Third Street into a pedestrian area was undertaken within the downtown redevelopment program. Looking five

decades back, during the post-World War II years, the former significance of downtown Santa Monica altered together with the vitality of its shopping street. The decline was caused in part by the off-centre location of new regional centres that polarized most of the retail activities. In 1965 the City initiated a spatial intervention in its urban core, in order to alleviate the disadvantages of functional polarization for the quality of urban living. That materialized, ironically, in a functional solution to interrupt the continuity of automobile traffic on the street grid, in order to create a pedestrian public amenity. An area on the Third Street was closed between Broadway and Wilshire Boulevard. The new spatial element was renamed the Santa Monica Outdoor Mall. However, the Outdoor Mall has not been successful in attracting neither significant shopping crowds nor downtown visitors. This designated public space offered an uninviting abstract space barely showing any emotional or human touches.

In order to correct that, the developers and city authorities moved on with another functionalist answer. They expected that a retail anchor of larger magnitude would boost the liveliness of the surrounding public area. So in 1980 the Santa Monica Place, the indoor shopping mall, was constructed at one end of the Outdoor Mall, and although this was a step further towards downtown revitalization, it did not imply any concerns to involve users' participation in the production of space, or to produce public amenities that would address the diversity of users' preferences; only a decade later, in the 1990s, the need for a public management agency became obvious. By 1984, the City of Santa Monica deemed the mall economically unsuccessful, unsafe and blighted. The Third Street Development Corporation was formed in order to manage improvements. The Corporation was a non-profit, public benefit organization, founded by the City in order to redevelop the mall and its surrounding area into an economically successful, thriving downtown centre. Three years later, the City adopted a mixed-use development plan, the Bayside District Specific Plan, which the Corporation created with the City's assistance. The redesign of the Third Street Promenade was focused on activity densities and human scale.

According to Denny Zane, the former mayor of Santa Monica who contributed to the creation of the actual configuration of the Promenade, to achieve a social goal and at the same time to comply with individual choice for economic prosperity required a coordinated political effort. That is a reflection of the socially conscious agenda of local government, and as mayor Rosenstein said by way of justification "[t]his is a community that respects itself and struggles to do the right thing – to provide the best quality of life it can in a difficult urban environment." [12]. At present the Bayside District Corporation manages the development area. It is a public-private management company that works in partnership with the City of Santa Monica on issues impacting downtown. For sure, during this five-decades-long process, the space produced on the Third Street Promenade is an identifiable place in downtown Santa Monica, and is an expression of the image this city intends to project to the world. Although the main purpose of visitors of the Promenade is consumption, there is a civic dimension to this public space: the Promenade represents a common place that spontaneously gathers a crowd potentially representative for the Los Angeles region, and its spatial production conforms to this community vision for civic life.

## 3 THE RIGHT TO THE CITY

The "right to the city" formulation has been used in the last four decades as a form of resistance to the homogenizing planetary urbanization, and as a ubiquitous "cry" for the democratization of urban space (refer to [9], [13], [14], [15], [16]). Through resistance and political action, the right to the city becomes "rather an oppositional demand, which challenges the claims of the rich and powerful" [17] (p.71). Within these political actions, regrettably, the voices and implicitly actions of spatial designers have been overlooked more

often than not, in spite of them being main actors in the process of spatial production. On the one hand, the dialectical nature of the process of design reasoning might explain this state of affairs, by comprising such struggle, but in an introvert manner. On the other hand, however, it seems there is little awareness within the design professions of practitioners' public role, not only through the spatial materiality of their work, refer to Hannah Arendt's understanding of praxis as a political act [18], but also through their informed engagement in the civic life.

At the end of the 1960s, French philosopher Henri Lefebvre urged for the need to take seriously into consideration political struggles for the right to the city. He understands this struggle as a means to renew the urban society and to renovate centrality, as well as opportunities to create such rhythms and use of time that would enhance the mastery of the economic, and the use of space (including moments and places). Within the right to the city, the right to centrality is seen as essential, but "[c]entrality of course does not imply the centre of power but the regrouping of differences in relation to each other" [9](p.19). The right to difference in the city --being a perpetual struggle-- would grant some shape to the right to centrality. As Lefebvre develops further, "[t]he 'right to difference' is a formal designation for something that may be achieved through practical action, through effective struggle - namely, concrete differences. The right to difference implies no entitlements that do not have to be bitterly fought for. This is a 'right' whose only justification lies in its content; it is thus diametrically opposed to the right of property, which is given validity by its logical and legal form as the basic code of relationship under the capitalist mode of production" [3](p.396).

While the right to difference provides the access to the city as specific places, as places of difference (see also [14]), top-down decision-making processes turn these urban locations into abstract spaces (see Section 1). By placing in comparison the natural body and the abstract 'conceptual' space, Lefebvre [3] explains that "just like the fleshly body of the living being, the spatial body of society and the social body of needs differ from an 'abstract corpus' or 'body' of signs (semantic or semiological - 'textual') in the following respect: they cannot live without generating, without producing, without creating *differences*. To deny them is to kill them." (p.396). Moreover, there is a 'secret' ability in nature "to produce differences 'unconsciously' out of repetitions [through gestures or rhythms]" [3](p.395), which is disabled within the abstract space. Lefebvre [3] asks, however, "Why should spaces created by virtue of human understanding be any less varied, as works or products, than those produced by nature, than landscape or living beings? We can now begin to see the full implications of difference, which ultimately generates the contradiction between *true space* and the *truth of space*" (p.397).

Thus the two examples discussed in this paper illustrate moments within political actions for the right to difference, centrality, and political participation in decision-making processes. At the time when Lefebvre published his revolutionary ideas regarding the right to the city and on the contemporary production of space, an activist engaged in community development studies for the commons, Sherry R. Arnstein [19], wrote a paper on citizen participation from her experience with community work in the US. She proposed a hierarchy of different degrees of citizen engagement in decision-making processes, which she called "the ladder of citizen participation", aiming to provide a finer grain of detail to this generic and ubiquitous term that implies various degrees of citizen power in urban politics. Until today this journal article became a reference for the topic, despite the more 'top-down' organization of participatory processes that she experienced at the time of writing it. So she argued that the degrees of power granted to citizens in participatory decision-making processes vary on eight rungs of the ladder, from nonparticipation (i.e. manipulation, and therapy) through tokenism (i.e. informing, consultation and placation) reaching citizen power (i.e. partnership, delegated power and citizen control). The rungs on the participation ladder are well illustrated in the two

development cases that I described in Section 1. While in Santa Monica, California, citizens have delegated power and control over the implementation of their decisions, in Belgrade, Serbia, the citizens are still at the lower rungs of either nonparticipation or at best informing about spatial development in their capital city. Yet in both cases, spatial designers have used their creativity and dynamism to mobilize the necessary resources and networks to help advancing their fight for the right to difference, and have access to centrality toward achieving the ultimate goal of spatial appropriation of their cities.

Spatial appropriation (see Section 1) in the sense of 'taking possession of space' actually refers to a sense of belonging to a certain place. Similarly to the ongoing struggle for the right to difference, the spatial appropriation is not a one-moment endeavour for a society, but rather it is a process of shaping social space over time. For instance, the process of everyday spatial practice in traditional settlements creates an appropriated social space, which could be achieved, according to Lefebvre [3], through "self-presentation and self-representation" of a particular society. In the following sections I argue that our contemporary cities may be appropriated through conviviality and political participation of citizens in choices and decisions about important urban matters, in political action toward the right to difference and self-representation. Nevertheless, spatial designers should take seriously their role of engaged political actors in the life of their polis.

## 4 PRACTIONERS HERE AND NOW

The capability to balance the contradictions within the process of design depends on practitioners' capability to decipher the environment and on their ways to understand phenomena. In the case of complex systems like many of those related to urban development, the traditions of planning thought "revolve around one core concern: how knowledge should properly be linked to action" [20](p.74). For instance, Ali Madanipour [21] urges "the need to go beyond these single-view perspectives [e.g. rational model] and elaborate a dynamic, multi-view perspective into what is a multidimensional part of social reality" (p.165). My premise is that such a dynamic and multi-view perspective could be achieved if spatial design practitioners learn to create opportunities for reflection-in-action, in order to make sense of surprises, to act in ad-hoc circumstances and make many times informed but rapid decisions. More than two decades ago Donald Schön [1] made the distinction between the ubiquitous "school knowledge" tradition, which considers knowledge as a finite product, and "reflection-in-action", which adjusts the process to engage and react to particular circumstances.

> *This reflection-in-action is tacit, spontaneous, and is not a particularly intellectual activity. And yet it involves making new sense of surprises, turning thought back on itself to think in new ways about phenomena and about how we think about those phenomena. Examples lie in ordinary conversation, making things, fixing things, riding bicycles* [22]. [...] *Practitioners reveal a capacity for reflection on their intuitive knowing in the midst of action and sometimes use this capacity to cope with the unique, uncertain, and conflicted situations of practice* [1](pp.viii-ix).

This type of activity is very similar to the spontaneous nature of political activism, which leaves little room for preparation in terms of risk evaluation, as many times activists should react on the spot and also plan iterative processes, while staying faithful to a long-term vision that springs from strong ideology and convictions. From this perspective, an essential requirement for the ongoing political process is their civic presence, and for that matter of spatial designers as activists as well.

Moreover, similarly to Rittel [23] I consider spatial design as a process of forming judgments about the problem prior to problem solving. Instead of problem solving according to a

prescribed set of performance criteria, "[o]ne of the arts [...] is actually postponement of the formal decision in order to enhance the process of forming judgments" [23](p.324). To that, the dialectical nature of the design process brings the spatial designer at odds between the (re)quest for repetition and specificity.

> As also Lefebvre contends, *"The architect occupies an especially uncomfortable position. As a scientist and technician, obliged to produce within a specified framework, he has to depend on repetition. In his search for inspiration as an artist, and as someone sensitive to use and to the 'user', however, he has a stake in difference. He is located willy-nilly within this painful contradiction, forever being shuttled from one of its poles to the other. His is the difficult task of bridging the gap between product and work, and he is fated to live out the conflicts that arise as he desperately seeks to close the ever-widening gulf between knowledge and creativity*" [3](p. 396).

### 4.1 The Relationship between Spatial Designers and Local Communities

In context I am convinced that rather than a sequence of activities, the planning and design practice is a process that depends on the state of understanding the problem; yet to build an understanding of the problem calls for procedures that are appropriate to the problem. Then how can designers grasp the "unique circumstances" to respond to the particular political economy of a community? Spatial designers could interpret local communities as outside observers, based on field surveys, participant observation, comparative analyses etc.

If it would be to consider ways of being rather than ways of acting, I suggest that understanding the stranger's way of being is appropriate for preparing practitioners to accept, decipher, and negotiate differences. Therefore, on the condition of being a stranger, I draw on Georg Simmel's [2] description of the stranger as a social type. To determine social typologies he focuses on forms of social interaction and contextualizes sets of observations within systems of meanings. If one considers opposed categories as constitutive of the social order, Simmel's central analytical interest is oriented toward sociological dualism in terms of conflicts and contrasts between the opposed categories. Levine explains in the introduction to Simmel's sociology [2], "The conflict between established forms and vital needs produces a perpetual tension, a tension which is nevertheless the source of the dialectical development or replacement of social structures and cultural forms throughout history." Thus Simmel's dialectical understanding of the stranger refers to a dynamic process directed toward the accomplishment of an ideal, which is endogenously determined by the capabilities manifested in each individual existence. Based on Simmel's theory of forms as synthesis of opposites, the stranger is at the same time in a state of detachment and attachment to a place.

> *The stranger will thus not be considered here in the usual sense of the term, as the wanderer who comes today and goes tomorrow, but rather as the man who comes today and stays tomorrow – the potential wanderer, so to speak, who, although he has gone no further, has not quite got over the freedom of coming and going. He is fixed within a certain spatial circle – or within a group whose boundaries are analogous to spatial boundaries – but his position within it is fundamentally affected by the fact that he does not belong in it initially and that he brings qualities into it that are not, and cannot be, indigenous to it. ... The state of being a stranger* [...] *is a specific form of interaction.* [...] *The stranger is an element of the group itself* [...] *whose membership within the group involves both being outside it and confronting it*" [2](pp.143-144).

The stranger -or, by analogy, the spatial designer- is at the same time in agreement and belonging to a place, and in confrontation with it due to an implicit urge toward experiment and innovation. Richard Sennett [24] wrote an article on the foreigner inspired by Simmel's

understanding of the stranger's role to expose "the sheer arbitrariness of society's script, which insiders follow thinking lines have been written by Right, Reason, or God", and continues with the foreigner's knowledge about living a displaced life. To understand the meaning of these roles, Sennett reminds us of Sophocles' Oedipus: "The two wounds on Oedipus's body are thus a scar of origins that cannot be concealed [his ankles bear a scar that marks his origins] and the wanderer's self-inflicted scars that do not seem to heal" (p.192). The two scars represent the conflict between the truth claims of belonging and the truth discovered by wandering. And to come to present times, Sennett places this ancient conflict at the origin of the modern tendency to change societal arrangements at will, and to treat community, identity and roots as borders to be sealed rather than boundaries to be crossed.

So incorporating the stranger's perspective in spatial design practice can bring to local communities additional information that helps to build a complex understanding of problems. Moreover, as a teaching method of design it is a means to develop a habit of stranger-like spatial research, due to which future practitioners could take into account differences, turn information from strangers into data, and act reflectively in heterogeneous contexts that these differences generate.

## 5 CONCUDING NOTES

The contribution of this essay to the Innovation and Experiment Section of the ICAR2015 Conference is to reassert the spatial design professions as activism. Rather than totally depending either on the free market choices or on the public authorities that are, if not passive, mostly reactive to market-driven development processes, design practitioners may act in the city empowered by their very own craft. In the last five decades there have been a multitude of experiences with participatory process and political action in the city, which may serve as inspiration to adapt to the specificities of places. Yet the process of design and the condition of spatial designers as political actors require a dialectical understanding, as an ongoing struggle and a continuum process to shape urban democratic space.

I believe that such civic presence of spatial designers has the potential to revive the relevance of the spatial design professions as communication vessels for cultural, civil and democratic urbanity. This perspective may become a part of larger endeavours to structuring frameworks for the transfer of knowledge from practitioners to citizens.

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# RESEARCH AND PRE-DESIGN

**Dragana Konstantinović[1], Miljana Zeković[2]**

[1]*Department of Architecture and Urbanism, Faculty of Technical Sciences (Serbia)*
[2] *Department of Architecture and Urbanism, Faculty of Technical Sciences (Serbia)*
*konstan_d@uns.ac.rs, miljana_z@uns.ac.rs*

**Abstract**

A traditional approach to architectural design, established in design courses today, is a complex methodological platform taught and practiced as part of the learning process in architecture. This methodology is developed by introducing increasingly complex architectural programmes during the course of studies, the ultimate goal being to empower a student for independent design practice. Complexity of this process and the vast amount of knowledge and skills proposed as an outcome often leave little time to reassess the process itself and indicate key designer issues. This paper describes the premises for realization of a research-based design course, which, on a master level, additionally emphasizes the research potential and investigates capacity of the research process as a basis for design. Space and duration of a single semester studies are dedicated to crafting a master thesis design platform, through process-focused work, rather than a result-oriented one. Simultaneously, this program is a basis for creating students' signature design approaches and an experience base for future endeavors.

**Keywords**: Architectural design; Architectural research; Pre-design; Design Concept; Architectural programme

## 1 DESIGN PROCESS

Architectural design is methodologically complex process, which prescribes a sequence of work phases in addressing architectural issues. Although regarded as a methodology, the design process is rather ambiguous, what further inhibits its full scientific explication. Even though there are certain process phases that allow its consideration through algorithms, the creative act within prevents from setting clear boundaries to the methodology and objectifying it. In such a context, the agent in the process – the designer – becomes an important decision factor in the creative 'spiral' movement, through critical evaluation of the process performed by the process creator himself. The power of critical evaluation is as equally important as a character trait to a designer as his capacity, and this dialectic procedure is intense throughout the process.

If we talk about the process which is complex in its nature, numerous doubts in the approach of learning it become obvious. The means and strategies of how to "equip students with facts and skills" [1] in a design studio are constantly evolving, but routinely evaluated through the final result - design object. This approach sometimes does not give students full comprehension of the process behind design, or ability to fully develop their personal design methodology.

In this respect, shifting the emphasis on the process – as a sequence of questions to be addressed – could be a significant starting point in studying (architectural) design. These methods are learned, developed and rendered increasingly complicated during the course of

architectural studies, in order to establish “a way of thinking about making architecture” [2]. A key place in the proposed methodology is certainly the pre-design research phase, which becomes an important tool, resource and method of forming a base for contextualized and intelligent design solutions that compliment life and improve living, and whose innovation is based on a critical and problem solving approach, whether they be experimental projects or actual tasks resting on the firm ground of reality.

## 2 RESEARCH AND/OR DESIGN

Research and design are often regarded as separate fields that naturally follow the general process of separating theory and practice, and even architects, classified at either end of this distinction. Thus, practice disassociates itself from theory, which has no touch with reality and practical design issues; on the other hand, theory thrives on fringes with other disciplines, exploring the limits of the past or the future, avoiding conflict with the present that belongs to the practice.

However, numerous contemporary tendencies move precisely towards bringing these two opposite fields together, in order to integrate them into a unique architectural field, where, as Jeremy Till states in his position paper for RIBA's Research Committee, unity of academia and practice is precisely based on processes, products and performance as their common denominators, in perpetual interaction [3]. As a key point of this relationship, Till identifies the potential of academia to inspect the "archeology" of the production process of architectural practice, "in a non-threatening but critical manner, critical here not being a negative term but one of reflection and comparison. By excavating the present one informs the future. Practice has the raw data on which architectural knowledge is founded; academia can release this potential through research. The focus here is not on the products of architecture, buildings, but on the processes, and by shifting the attention from the individual object to a comparative archaeology". This argument supports the idea of a new approach to studio course development, the one that deals with process, rather than product, as central, anticipating future outcomes not necessarily pertaining to one field or the other. In addition, this widens the field of architectural research that can be undertaken during higher stages of education.

Another issue additionally encourages these changes. Multifaceted influences regarded through a complex investigation of architectural programme, move, in a way, the domain of research from investigation of form to examination to architectural functions. Tsonis emphasizes that "after a long tradition of dealing only with objects" architecture must "focus on the everyday user and uses of the built environment" [4]. Strategies of this shift actually indicate that process of *form-finding*, in the expression of Peter Eisenman, which have often defined design methodologies, seek new inspection and basis of these endeavours, be it on programme tradition, as practiced to an extent by Tschumi or Koolhaas, or in empirical assumptions of data management, present in the work of MVRDV, or some other equally respected praxis.

## 3 RESEARCH-BASED DESIGN

With these in mind, we decided to make an experiment and create a research design studio on the master level (module Architectural and Urban design), within the course Architectural Design of Complex Programmes (2014/2015). With modest physical and technological

capacity of the space we were working on, we had to create a course matrix which will keep the one semester long design research in energized and vivid state, while students create a solid base for their future Master thesis work. Although this Master module implies designing as the principal category of work and design as a product/result, we found that architectural research focused on pre-design stage essential and justified on several levels. (1) Firstly, we found it necessary to synthesize design experience not through the complex design product (the one with complex programme), but through layered design process. This endeavour will enable students to tackle, once again, and for the last time before they leave the University, all the issues of research based design and its potential for concept anticipation. The work on the course has the form of the loose predefined assignment matrix, which is changed and refined through the course lifespan, tackling general and individual issues of design process, through space design workshops, diagramming, space programming, architectural research, presentation and discussion. Thus, the focus of the work/research is shifted in pre-design stage, putting the emphasis on concept research, instead of form finding.

(2) The platform of this experiment - the course itself - gave significant impetus to this decision. The notion of programme, as an internal force of design is integral prerequisite for anticipation of the concept. It is understood and thought as a "complex spiritual product" with a capacity to move design process. In such definition, there are no un-complex programmes, only "banalised" programmes, and whatever design type student choose, it can fit under this paradigm. (3) The outcome of the course work is an individual design concept/platform, which is to be developed in Master thesis, completely embedded in design research executed through semester, as a result of personal development of design methodology which can be starting point for future practice. The synopsis of the thesis thus comes in no pre-described form, but includes documented process of research, space concept development, contains series of diagrams, notations and maps, by which the conceptual platform of the future design is kept in raw and evolving state, while the result of the studio becomes design process, not design product.

### 3.1 In the Studio

Pilot testing of this methodology gave the expected results, validating the necessity for such a comprehensive experience. The student task was to make their own choice of design problem/phenomenon, which will evolve in their master thesis design project, and initialize design through design research in the studio. The result of this process – a documented design research – de facto indicates certain issues that needs to be addressed in further course development and realization. Firstly, there is an emphasized conventionality in perceiving problems/phenomena in approach to topics and realization of the research process. In fact, the choice of problems/phenomena itself is not in accordance with the maturity of the designer, which could, at times, be far more sensitive in perceiving environment and more innovative and experimental in approach, judging by previous professional experience. At this early stage, students were not influenced to broaden their interests, deepen their research or specialize their interests. The research capacity was, therefore, decreased, greatly limiting the scope of design and research methodologies and strategies.

Further work on development of a solution indicated existence of a solid base of practical design skills for common architectural typologies, but a lack of desire to approach them in an innovative manner. This approach is also typical for work on architectural programmes which are not considered as a stepping stone for actual architectural breakthrough or "architectural twist". Work on programme and concept development, which, in certain cases leans on programme solutions, indicates a superficial and an outdated system of premises that a priori cannot significantly contribute to architectural practice in general. A simplified representation

of the programme concept, almost fitted to specific students' needs, is prominent in this work phase. This hinders its further development and prevents establishing a future project concept on its basis. A system of associative elements – cubes – is introduced, to indicate ideas and concepts already clear in oral presentation, as a rule of representation of programme and indication of space defined by the programme. Literal interpretation of these elements as space, in the manner often performed, fails to introduce a single innovative design layer during the project elaboration process.

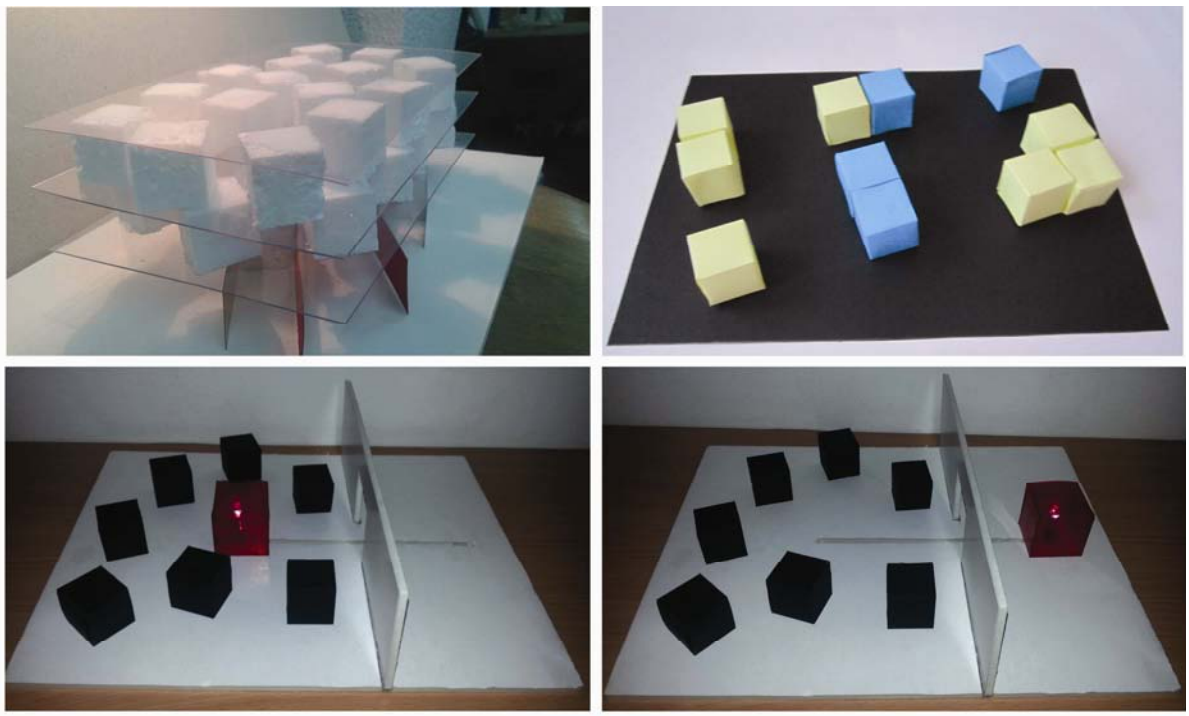

Fig. 1: Spatial presentation of programme: (up-left) social hosing project - programme distribution, (up-right) student dormitory - module(s), (bellow) kindergarten for gifted children

The situation is similar with contextual analyses that adhere to well known criteria and methodology. In this segment, the influence of transdisciplinary modes of perception and analysis of contemporary state is present only in fractions, in projects whose end result cannot be fully grasped yet. Although transdisciplinary research is not directly promoted as a dominant approach, it is, to a certain extent, suggested by an almost natural deference of the design approach to such form of transfer of experience and methods from other disciplines. Rare application of such methodologies indicates potential need for promotion and introduction of research formats that would additionally emphasize all benefits of such an approach and establish analogies.

Application of analytical design tools is extremely rare. In this respect, representation of ideas, systems of thought, problem analogies and general systematization of designer issues are not regarded via an analysis tool, especially not in form of diagrams, maps or notations. The fact that the topic of graphical analytical-designer tools is not investigated until master-level studies, as an introduction into their potential application, may provide some explanation to their absence. However, program coursework did not instigate use of such a valuable design methodology in the slightest, nor did it indicate a positive shift towards such a practice. Nature of the final result was somewhat influenced by this; resulting spaces and

actual design solutions was only partially conceived on basis of analysis/conclusions done in the research stage.

To conclude, one might say that defining of spatial concept as a result of research preceding the design phase is, in fact, a weak link in the design methodology. Final analyses predominantly present these two aspects as separate entities overlapping only on occasion. In addition, generating a spatial concept is, still for many, an uncomfortable process to be addressed merely in view of meeting course requirements, even during the primary design phase.

Fig. 2: Urban mapping - Museum: urban intersection, rare example of applied urban research

## 4 COURSE EVOLUTION

This year's pilot experiment has provided certain experience and confirmation of the assumption that the design process in the final years of architectural design studies must be comprehensive. Work on certain typologies and assigned urban spaces has given students knowledge and skills to approach future design commissions, but the complexity of issues has often overshadowed the remaining questions of spatial design, concept, programme and meaningful contextual analysis. This was the basis for seeking to revisit this process on the master studies' level, in the natural sequence of its phases on a mature level of research that would, in the given format, offer outstanding potential for development of the design concept. In that respect, the programmes' complexity was considered from a perspective of the level of intricacy of the approach to the issue, as a reminder to essential aspects of a correct design approach; one that is founded on rational conclusions of the research process, from which conceptual arguments are generated and, as a final result, through which an original design platform evolves.

Introduction of a research design course must be, to an extent, supported by reforms in lower level design courses, where at least some of the key topics would be put into proper perspective. To a certain extent, this implies generating a unique system of courses that complement each other to create an integrated system of knowledge of design process, gradually gaining in complexity towards master studies. Until now, only 3rd year undergraduate design course gave significant results in this respect.

Further course development must systematically address all identified weaknesses of the methodology in question, through a strictly guided system of exercises and steps to additionally trace the research-design process. Also, choice of study topics and approaches must have appropriate leverage in the work process and should be openly debated and analyzed. Experience has shown that various topics were out of students' focus, due to the fact that they were not given enough thought and space, having counted on their previous graduate experience. Further course development will be oriented along two major strategies: establishing a system of exercises to further problematize the question of architectural functions and design issues: spatial syntax, movement and fluctuation in space, orientation, spatial perception, space-programme relation, as well as other key spatial design issues [5]; In addition, the course will encourage application of this experience in the individual research process and promote inventions of personal strategies and approaches. It is expected that this will revitalize the process of course work, establishing a duality of the rhythm, which Buchholz refers to as "a pace of constancy and a pace of speed"[6] These methods are expected to enable students to conduct autonomous research as basis for their original design work, identifying key design issues relevant to their own topics, rather than general remarks.

## AKNOWLEDGEMENTS

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# WHAT MATERIALS DO WE NEED FOR OUR FUTURE?

# CASE- STUDY: GLASS

**Carmen Ştefania Dumitrescu**

*Ion Mincu University of Architecture & Urbanism, Bucharest (ROMANIA)*
*carmen.dumitrescu2007@yahoo.ro*

**Abstract**

We live a time of rapid and significant change: changes in our lifestyle, in the way we relate to the natural environment, in the technologies and materials we use.

The current real need for new ideas is putting us all on pressure: we have to experiment more, to be creative, to innovate.

We will present some interesting experiments and innovations, coming from different areas, from art, architecture, design, the science of materials. These examples will help us define some of the most promising directions for future developments in architecture and design.

Context:

The current crisis seems to be only the tip of the iceberg; it seems to be the symptom of a real threshold, the end of an era, the challenge to start a new one. We experience rapid and massive changes, therefore the need to assess and then re-imagine and re-invent our built environment.

Learning from the past:

It is necessary to evaluate correctly the current realities, understand the complex problems we have to surpass, choose the positive elements to build upon – we will discuss some relevant examples from urbanism, architecture and design.

Prospecting the future:

We should consider all sorts of new ideas and inspiration sources: scientifically defined or popular culture trends, futuristic models, SF, fundamental and applied science. We will attempt to present some of the most promising potential developments, the ideas that might shape our future, illustrated with relevant examples from urbanism, architecture and design.

Brave new world:

Humanity is now starting to structure the project of an expanded and refined artificial environment, a world with new dimensions - built environment on earth, built environment in space, virtual reality.

Materials for the future:

We need new materials and technologies for the future: these materials should be polymorph, adaptable, sustainable, ‘smart’.

We will present the case study of Glass, a key material for the brave new world. A material that is known and used since the Antiquity, glass had an impressive evolution up until our time and now seems to be the perfect candidate for becoming the “best material for the future”. From a new Glass House, to new glass products, to “A Day Made of Glass” – glass

proves to be extremely versatile and spectacular, a valuable material in terms of use and re-use, for pragmatic and esthetic purposes.

The challenge to innovate: why and how?

We need to change our paradigm, our attitude and our approach.

We should build useful experience upon all sorts of experiments, from art to research in fundamental and applied science; we should learn from each other and then we should get to work together in inter-disciplinary teams, even across boundaries, into trans-disciplinarity.

We should also incorporate these ideas into our day-to-day architectural practice and into the specific education process – the new generations should be prepared to produce new concepts, to have the courage to implement them and experiment, the force to innovate.

in this endeavor should be:

**Keywords**: creativity, innovation, sustainability, responsibility.

## 1 INTRODUCTION

We live a time of rapid and significant change: changes in our lifestyle, in the way we relate to the natural environment, in the technologies and materials we use.

The current real need for new ideas is putting us all under pressure: we have to experiment more, to be creative, to innovate.

We will present some interesting experiments and innovations, coming from different areas, from art, architecture, design, the science of materials. These examples will help us define some of the most promising directions for future developments in architecture and design.

## 2 CONTEXT

The current crisis seems to be only the tip of the iceberg; it seems to be the symptom of a real threshold, the end of an era, the challenge to start a new one. We experience rapid and massive changes, therefore the need to assess and then re-imagine and re-invent our built environment.

Before the crisis, we lived in a consumer's paradise, enjoying diversity, having plenty of choices. Then, the crisis brought us all at the point of destruction. Now, it seems that we are starting to go up again, keeping in mind the lessons learned.

We are experiencing accelerated and important changes on many levels: changes in the way we see the world, our paradigm (better understanding of the complexity of the phenomena, the intricacy of interactions, the implications our actions have on short and long term, locally and globally), changes in our attitude (we become more responsible, hopefully), we change our priorities and therefore our development strategies. But in order to orient all these changes to the right direction for the future, we first have to understand the lessons of the past.

## 3 LEARNING FROM THE PAST

It is necessary to evaluate correctly the current realities, understand the complex problems we have to surpass, choose the positive elements to build upon.

It is obvious that we are living substantial changes, perhaps even mutations, in our life style, we become more and more dependent on modern technologies – we should study and understand this phenomenon, understand its effects and implications. We should asses and choose between the already existing technologies, we should make informed decisions on what we'll develop next – low-tech and high-tech may coexist, traditional materials and technologies might be used in innovative ways.

We should reconsider the relation between natural and man – made environment: we now recognize the effects that our exploitation of the natural resources has done to the natural environment, climate change, destruction of valuable eco-systems. A very lucid evaluation of the resources still available and a truly sustainable development strategy are essential for our global future.

Assessment of the existing raw-material resources – traditional ones and new ones, needed for the rapidly expanding new technologies.

An interesting direction is to transform waste into resource: this idea is especially valuable for the building industry – using demolition wastes for producing new building materials, for example, can be done by bringing together inter-disciplinary teams that would include chemists and structural engineers, architects and biologists, decision makers and beneficiaries. Re-using glass waste is a very promising research and application direction.

Another essential direction is that of the re-evaluation of the energy resources: fossil fuel, wood, solar and geo-thermal, wind and waves – fossil versus re-generable, short-term versus long-term sustainable strategies.

We also have to solve problems generated in the past, but difficult in the present and potentially dangerous for the future, such as global heating or deforestation, or severe cases of chemical and industrial pollution.

All these elements inevitably influence urbanism and architecture, as they directly impact on the way we live and our life-quality. Nowadays we see a lot of interesting propositions such as: land-forming, bringing into the city vertical gardens, planted terraces and hidro-ponic farms, new transportation systems, new ways to structure and use the available space.

New solutions for the use of land and energy should be synchronized with the changes in the way we live in the city and in our homes. The use of wood for heating, for example, can become, paradoxically, the reason for re-forestation and responsible cuttings.

## 4 PROSPECTING THE FUTURE

Future is approaching at a very accelerated pace – we have to change the attitude: not only to react, but to be pro-active, to prepare for the future. This is a real challenge, as we have to change the way we think, to generate new concepts, to make models, to test, to asses, and finally to apply innovative ideas. If we want to successfully explore possibilities, prospect the future, we have to make an effort to free the imagination and develop the creativity, to encourage risk-taking exploration and then switch gears and then use pragmatism and good management for implementing new applications. [1]

We should consider all sorts of new ideas and inspiration sources: scientifically defined or popular culture trends, futuristic models, SF, fundamental and applied science. [2]

Finding inspiration in sci-fi literature or film, collaborating with artists, cross- breeding methodologies, applying utopian ideas, bringing together different styles of thinking and working, complementary or even divergent competence are all to be tried and tested.

Utopias like the Venus Project [3] or the visionary propositions of architects like Grimshaw (the Eden Project) or Vincent Callebaut (Paris Smart City 2050) offer a lot of interesting ideas. [4]

Games like SimCity [5] or Second Life [6] offer the possibility to try and test ideas and even products in virtual reality.

Think tanks and interdisciplinary research teams come up with ideas and strategies for the future, innovation is the key to success.

## 5 BRAVE NEW WORLD

Humanity is now starting to structure the project of an expanded and refined artificial environment, a world with new dimensions - built environment on earth, built environment in space, virtual reality [7]. Our world is ever expanding, on this planet, on land, on and under water, in real and in virtual space – we have to prepare and plan for that, starting with school and following with new jobs and applications.

## 6 MATERIALS FOR THE FUTURE

We need new materials and technologies for the future: these materials should be polymorph, adaptable, sustainable, 'smart' [8].

We should re-interpret, re-invent existing materials, develop new materials, find new, large scale applications for high- tech, high-end materials.

We will present the case study of Glass, a key material for the brave new world. A material that is known and used since the Antiquity, glass had an impressive evolution up until our time and now seems to be the perfect candidate for becoming the "best material for the future".

This is very plausible, since the needed raw-materials are in good supply, glass-waste can be transformed into resource; furthermore, its areas of application are extremely large, from the building industry to consumer goods, computer and communication technology, medical applications etcetera.

From a new Glass House, to new glass products, to "A Day Made of Glass" [9] – glass proves to be extremely versatile and spectacular, a valuable material in terms of use and re-use, for pragmatic and esthetic purposes.

New propositions for glass houses [10], or glass facades for offices and production buildings, for technical use or for esthetic purpose [11], glass offers plenty of opportunity and choice for the architect and the designer [12].

Common or spectacular glass products, from spectacles to aero-gel [13], prove that glass is indeed a material for the future.

Material for the future: polymorph, adaptable, sustainable, 'smart', *glass* is indeed a key material for the brave new world.

## 7 THE CHALLENGE TO INNOVATE: WHY AND HOW?

We need to change our paradigm, our attitude and our approach.

We should build useful experience upon all sorts of experiments, from art to research in fundamental and applied science; we should learn from each other and then we should get to work together in inter-disciplinary teams, even across boundaries, into trans-disciplinarity. We have to develop and apply new ways to encourage creativity, to sustain the innovative spirit [14], to define new ways to work together for generating, testing and applying new ideas, for the brave new world.

## 8 CONCLUSIONS

We should also incorporate these ideas into our day-to-day architectural practice and into the specific education process – the new generations should be prepared to produce new concepts, to have the courage to implement them and experiment, the force to innovate.

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# THE GREEN BUILDING: TRADITION AND INNOVATION

**Lecturer Prof. Mihai Corneliu Drișcu[1], arch. MA. PhD.,**

**Assist-professor, Ana Cristina Tudora[2], arch. MA. PhD.**

*[1]"Gh.Asachi"Technical University, D.Mangeron,B-lvd43,Iasi Romania*
*[2]"Gh.Asachi"Technical University, D.Mangeron,B-lvd43,Iasi Romania*
*mihai.driscu@gmail.com, tudora_cristina@yahoo.com*

**Abstract**

The contemporary architecture is frequently seen as an example of "internationalism" meant to cancel the local traditions, transforming the human settlements into urban- functional extensions without identity. The fact that the architectural traditions proved to have found the harmony among the functional needs, the environment and the material resources are often ignored. The orientation of the design towards a sustainable development involves the assuming and reinterpretation of the old construction principles, ensuring the cultural continuity and the adaptability of the built spaces according to the economical and climatic changes.

Using elements, materials and technologies of the vernacular house, adapting them to the requirements of the contemporary life-style, must be assimilated as the right answer given to the current challenge concerning the environment problems and the global economic crises. These approaches stand both for functional-constructive aspects, specific to different regions and also for the use of ecologic construction materials.

Regional architecture is often neglected, leading to the loss of local knowledge regarding the manner of creating comfortable life with limited or even inexistent power consumption. The design of the contemporary house, can and should use the elements of the traditional house, as well as observe aspects related to the current lifestyle than cannot be neglected. It is a perceptive need for us to turn architecture back to the most profound human needs, to grow the impact of urban scenery on men's behavior through designing for people.

Sustainability can be seen also as a social responsibility for everyone, not only for architects or people involved in the design process. The concept of sustainable building incorporates and integrates a variety of strategies for both design and building process; the assessment methodology of environmental impact in the field of constructions represents also an extremely debatable subject, whose importance is highlighted by the more and more fast increase of the complexity of environmental issues at global level.

*Life Cycle Assessment* (LCA) represents an assessment process of pollution loads on the environment, associated with a product, process or activity. This instrument generally captures complicated network of relations between the location of the building, construction, its use and their impact on the environment, a network which is similar to the complexity of ecological systems in the nature, which operate as an integer, any change having a resonance within the system. Thus, the answer that architecture and therefore its product - construction gives to this new set of requirements on environmental protection can be scientifically underlined through LCA.

These aspects may have a decisive influence, because an object, even an architectural one, can became unnecessary or unsustainable if it is not embraced by the user and does not resonate

with local spirit. So, in order to achieve a sustainable architecture, socio-cultural aspect must be the starting point of the creative design process.

The topics under discussion are the main influences on the final architectural design, resulted from the application of a series of sustainable principles, mentality and the openness shown by future users towards technological innovations, present today in the built environment. The design approach fits as much as possible on a sustainable mindset, which can be viewed as an experiment in architectural practice. Therefore, the study exceeds the global field of sustainable architecture, which unfortunately at this time provides generic directions of approach, without taking into account the fundamental differences related to the geographical, cultural and educational typology. The article is trying to give a real answer to such requirements, therefore the client's role in decision-making is at least as important as the other issues discussed, emphasizing once again the fourth essential pillar of sustainable development, namely the cultural, social, environmental and economic ones (Jon Hawkes), but we may add educational practice, as well.

***"It's not the consumers' job to know what they want." -Steve Jobs*** [1].

**Keywords**: research projects, architectural experiment, sustainable development, tradition, education, innovation.

## 1 INTRODUCTION

The ecological issues became a worldwide focus in the last decades, along with raising awareness on the need of an ethical attitude towards the creative action, towards the current requirements addressed to the building sector, as well.

The dynamic interaction among tradition, technology and society deeply influences the human existence, leading to a change from one mode of subsistence to another [2]. The interest for environmental protection is a good example of such a change, giving rise to a new philosophy or morality [3]. This morality is first of all, based on, reciprocity, mutual benefit and on the inborn wish of the individual in order to obtain social approval...The values of sustainable development must evolve gradually …. at the same time with the acceptance of the idea that sustainability and human life quality depend on the integrity of natural environment [3].

Should we take a retrospective look, today we could discuss on a re (invent) of sustainability. The mutual connection between tradition and innovation within the architectural phenomenon leads to an extremely interesting answer given to various issues raised by human existence. Once awareness on environmental issues has been raised, overlapping of tradition and innovation in architecture became an extremely attractive sector and intensely used.

Detachment from the universal architectural language, imposed by the globalization, a redefinition of architectural phenomenon is noticed by the symbiosis between tradition-innovation, featured by an economic, social and environment-based context. The traditional experience and knowledge are frequently used as a starting point for sustainable design, bringing into attention again certain forgotten rules and principles of our predecessors, proposing a holistic approach, oriented, among other things, towards a protection of natural environment integrity, in its entire complexity.

## 2 SUSTAINABLE ARCHITECTURE – BARRIERS

Large scale adoption of the sustainable design may anticipate a replacement of the conventional methods and practices [4, 5, 6, 7]. Essentially, the application of the sustainable development principles supports the satisfaction of current needs, without affecting the quality of the living environment of future generations. Therefore, living conditions compatible with the environment must be created, acceptable from economic point of view and which should give priority to the occupants' requirements [8].

At global level, nevertheless, it is expected that the sustainable orientation of architecture gradually changes the entire building sector, the gap between regular and green buildings is profoundly deep, so that it is very unlikely that such effect occurs in the near future.

However is there a way to make design architecture sustainable? If the effect of sustainable architecture was going downwards, the adoption of a current practice would be plausible in order to focus more on the improvement of each project and less on the design of a project entirely environment-based.

The specialized literature suggests the existence of a series of impediments, barriers [9, 10], such as cost, lack of information, education, deficient legislation and esthetical and psychological boundaries which may prevent the implementation of large scale principles of a sustainable design. Furthermore, the incriminatory idea is increasingly formulated, according to which, the architects lost their sensitivity with regard to the perception of values by the wide audience of the architectural image.

Are the architects insensitive? Certainly, this is not an easy question to answer, but obviously there are differences between our perception as specialists of the most aspects determining the architectural phenomenon and the perception of the wide audience, in this direction.

The researches have constantly underlined this issue. In parallel with the sustainable development of the built environment, certain recent studies show that the satisfaction level of the green buildings' occupants does not exceed the satisfaction level of the conventional buildings tenants. Such result raises a series of questions: Does the population perceive the green buildings as being in agreement with its sustainability aspiration? Do the ratings of the environmental certification systems affect the satisfaction degree of the non-specialist population ? (see fig. 1) An important issue is thus revealed: the conflict between "the architects perception versus occupants perception towards green buildings ".

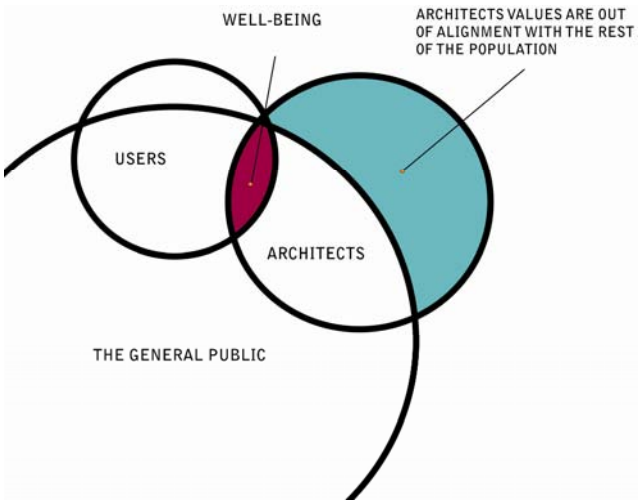



Fig. 1 Designing for human well-being

Presently, when the environment optimization of a building is being referred to, it can be noticed that attention is focused only on the environmental factors [11]. However, the sustainable construction is influenced both by the environmental, economic, social and cultural factors [12]. The ongoing search of a technical solution increasingly efficient, from an environmental point of view, leads to the ignorance of the human factors, which are abstracts and difficult to measure. Generally the quantitative factors are privileged, in relation to the quality factors, although the quality-based factors are mostly required when measuring the built environment quality. Such factors make the difference between the environment efficient buildings and the buildings which are efficient and desirable.

*"Sustainability is about poetry, optimism and delight... The unquantifiable is at least as important as the quantifiable."* [13]

The ignorance of human factors does nothing else but to annul the entire invested effort in order to make buildings more efficient from an environmental point of view (time, money and resources). At a very basic level, if people don't like it and don't want to use it, how can a building be sustainable, not matter how 'green' it is in every other respect? [14]

## 3 DESIGN, BEHAVIOUR, ECOLOGY- CASE STUDY

A common misinterpretation related to a sustainable architecture is that a building becomes sustainable only after the implementation of technology, in reality, such building becoming viable only if their design and occupants' behavior is optimized.

Consequently, the manner in which the ecologic profile of a building can be assessed is subject to debate. The general agreement of the scientific community is that the most efficient assessment of the environmental impact is the performance of a Life Cycle Assessment (LCA) (see fig. 2).

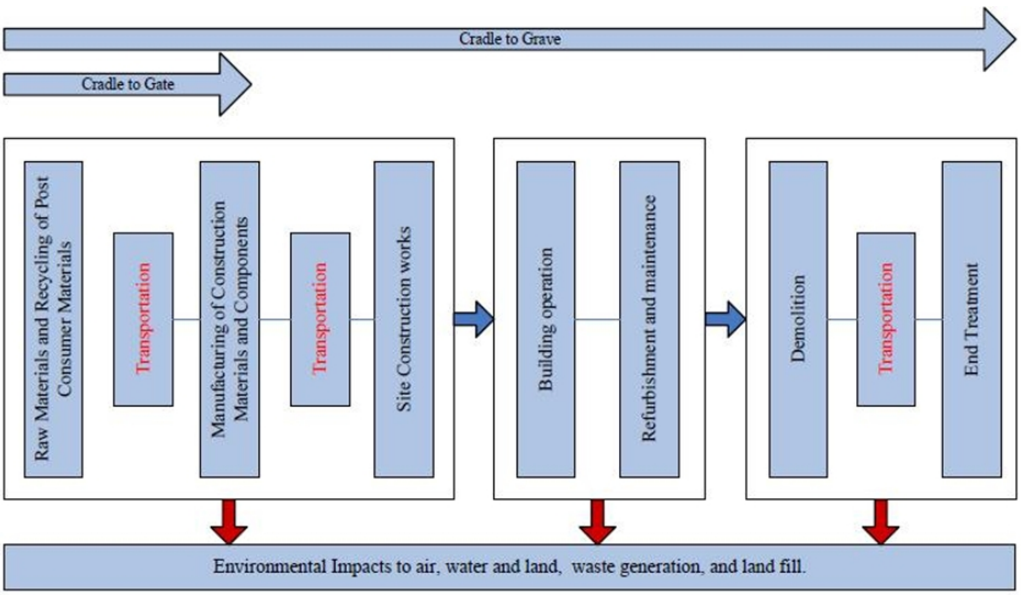



Fig. 2 LCA Chart [15]

The LCA specialists regard the building as a product, considering all the life cycle stages. Even it is extremely difficult, the LCA contains a series of issues, related, on one side to the high complexity degree, which makes its integration in the design difficult and on the other side, to the difficulties encountered during the interpretation of results, due to the multiple uncertainties, at data level.

As previously mentioned, the approach of sustainable design cannot be defined in simple terms, the cultural and social factors difficult to quantify entering the equation. For this reason, a fair start would be the development of a real project, under the auspices of the sustainable development principles, which take into consideration the context particularities, the social and cultural premises.

The study consists of making and analyzing, by means of a LCA study, of an individual house, for which were developed two constructive versions, with the same space morphology, geometrical shape, the utility function being performed similarly (see Fig. 3 /image 1).

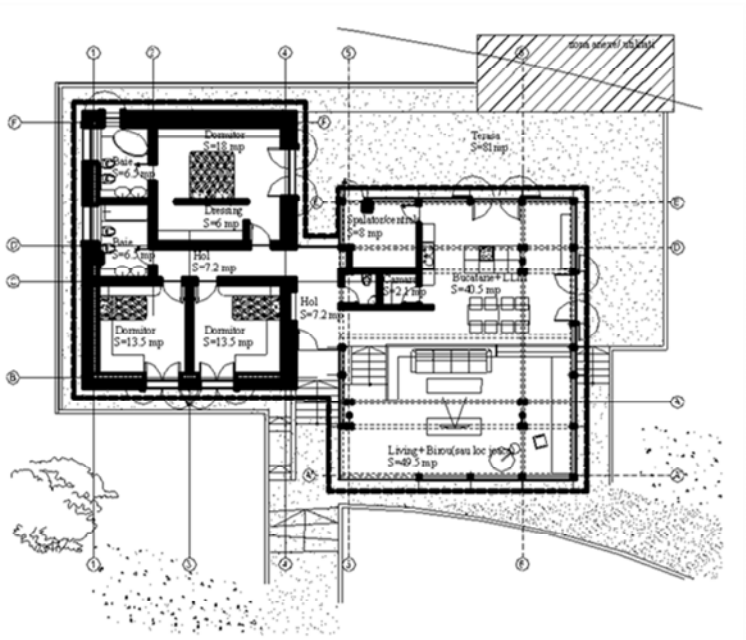
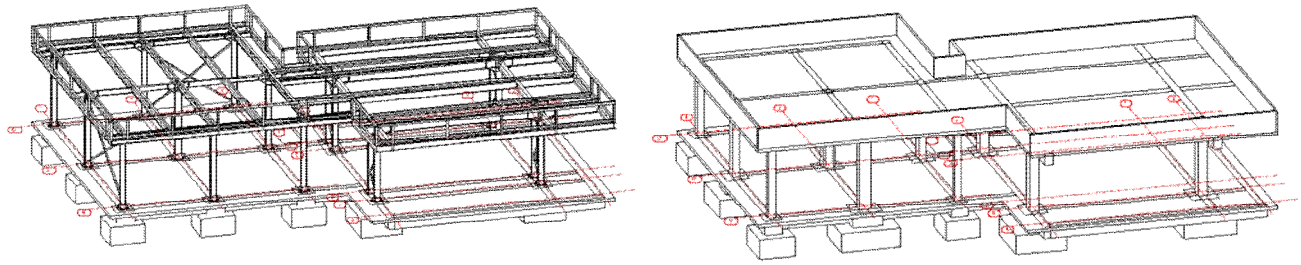



Fig. 3/ Image 1. House plan view

The notion of sustainability, recently imperative in architecture can be found in the past as well, before the increase of popularity of this concept. The famous modern architects used the intuitive logic in order to relate the house to nature and to ensure optimal use of the designed space. Obviously, the balance between the built and natural environment may be achieved without rigid calculations and standards, referring only to logic and common sense.

The house layout concept follows the conceptualized ideas of modernism: simplicity, flexibility, functionality, landscape integration. Therefrom the idea of cultivating an open subdivision appeared, of a fluid habitable space, concomitantly with finding technical solutions allowing the same. So two building variants were proposed, steel structure and light walls, respectively the reinforced concrete structure and masonry walls (see Fig. 4/ image 2).



a) b)

Fig. 4/ Image 2. a) Metal structure. b) Reinforced concrete structure

Nowadays, the perception of common tenant in our country, to the „durability" of reinforced concrete structures and masonry walls is appreciatory higher, in relation to the other building systems. The semantic meaning must be underlined, „the message" transmitted by the material, from the perspective of the practical mode, in which the occupant perceives, understands and assimilates it.

The advantages of the steel structure are, besides the technical benefits – easiness, accuracy of execution as well as, from the operating point of view, the creation of a free, flexible space (the family evolves at quantity and quality level).

Another approached principle of sustainable development in the project is the physical connection with nature, regarding the intermission of the indoor and outdoor space, both in the glazed areas and the type of materials used.

The LCA study followed all the required steps described in the present available literature and standards, taking into account the three stages of the lifecycle: construction, maintenance and end of the life. The time range during which the assessment of the building impact is of 50 years (see fig. 5).

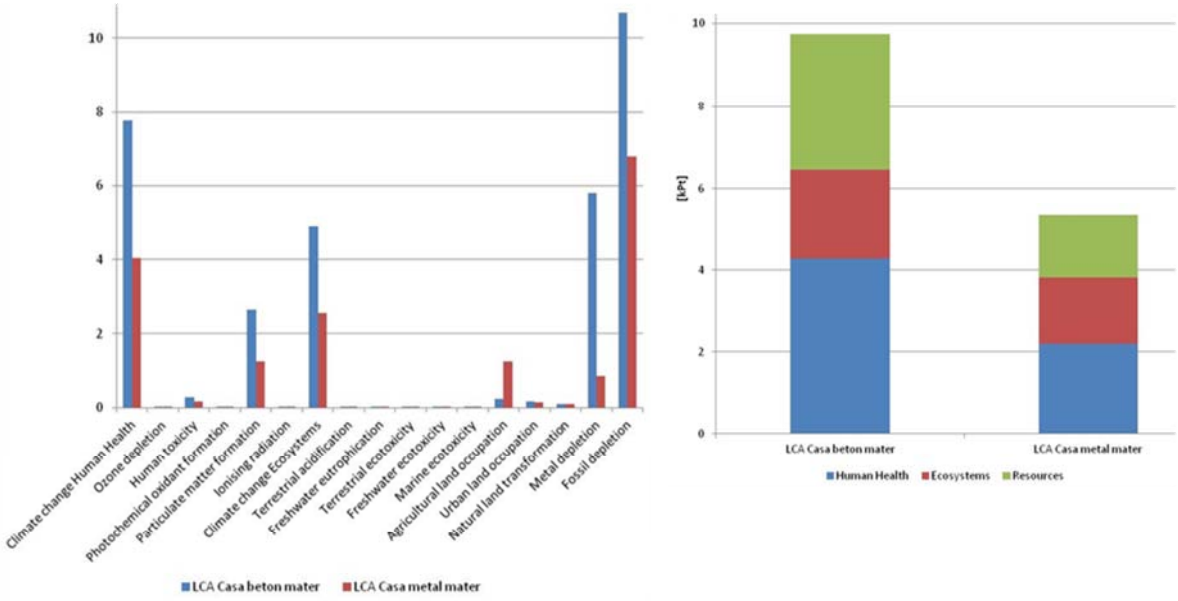



Fig. 5. Comparing 'LCA Concrete structure house' with 'LCA Steel structure house '; Method: ReCiPe Endpoint: a – normalization; b – single score.

Following interpretation of results, taking into account the other aspects, less quantifiable, related to the human, social and cultural sphere, both construction solutions were embedded into one single solution. The distribution of construction variants in the project was based on the principle of maximum use of the advantages offered by each of them. So, for the night area, where providing a safety, protection feeling was aimed at and where no re-subdivision or re-functionalizations were anticipated, during the time range, the use of reinforced concrete structure and brick masonry was proposed. In opposition, for the day area, where the space flexibility and opening prevail, the steel structure and light walls were chosen.

Fig. 6 Imagine 3. Execution stage

Furthermore, the design took into consideration certain aspects derived from the ecological thinking, which have not been included (see Fig. 6 image 3, Fig. 7 image 4, Fig. 8 image 5):

- Favorable cardinal orientation, equipment of glazed surfaces with shutters resistant to bad weather conditions;
- House layout on site, considering site slope and the existent vegetation;
- Use of recycled materials, where possible:
  - Recycled brick for façade plating;
  - Recycled corrugated sheet metal for metal roofing;
  - Recycled wooden girders, used for the interior design and surroundings;
  - Recycled stone blocks for courtyard landscape;
  - Crushed concrete originated from the demolishment of the industrial establishments used as filling material for the construction of alleys;
- Providing a planted roof on the reinforced concrete structure.

Fig. 7 Image 4. Ecologic approaches not introduced in the LCA

Beyond the data for which it would have been very difficult to make approximations (too many uncertainties result), an increased truthfulness level was aimed at, being introduced, depending on the system limits data and scenarios as close to reality. The data began to gain accuracy, when starting the real building process.

Fig. 8 Image 5. Details from execution stage

## 4 CONCLUSIONS

Today *Ecology* represents a wide scope business. To be ecologic or at least to be regarded as ecologic brings consistent advantages, reduced operating costs and long term benefits, such as the end of virgin raw material use. Even if many people support the idea of sustainability following a positive marketing, there is a surprisingly lack of knowledge and understanding both of sustainability as well as of sustainable development [16]. For this reason, the progress remains slow. Meanwhile debates regarding the influence of new ecological technologies and the role of politics, of legislation take place, the truth is that, in the long run, the attainment of ecologic desideratum pertains to individual behavior.

It is a perceptive need for us to turn architecture back to the most profound human needs, to grow the impact of urban scenery on men's behavior through designing for people [17]. One might say that architects, as a profession, took a wrong path, becoming too language-related elitist and they should start to pay more attention to the manner in which regular people experiment and perceive the architectural space. On the other side, we bear the responsibility, as professionals, to deliver to society an architecture increasing the living standard, producing emotions and inducing new ideas, transforming the general thinking mode.

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# SUSTAINABLE ASPECTS OF CONTEMPORARY WOODEN ARCHITECTURE

**Sergiu C. Petrea[1], Adrian Moleavin[2]**

*[1, 2]Ion Mincu University of Architecture and Urban Planning (ROMANIA)*
*Arh_sergiu_petrea@yahoo.com, adrianmoleavin@gmail.com*

## Abstract

"If timber is become the material of 21st century, advanced teaching will be necessary. To train technicians, engineers and architects able to harness the energy of the green revolution of the new millennium." (Roland Schweitzer)[1]

Wood is a modern material, even though his use is literally ancient; together with clay, wood is known as one of the first means of construction. Nowadays, its iconic image as a solid box, with advanced insulation is built with careful consideration for details and with great dexterity, either as a fragile-abstract ensemble or as an archetypal message that revokes the mystery of mythical forests. The present work aims to explore the main trends in the use of wood, illustrating them with case studies of our own work, as different situations occur in contemporary structures that focus on promoting sustainable perspectives.

The paper will further explain the use of wooden materials that are renewable and recyclable, as well as materials that are in some cases timeless and long-lasting. The study will focus both on high tech and low tech practice and on the eternal quest to achieve minimal operational energy demand. In the end it will be studied how by utilizing performing construction systems, we are able to reduce construction waste by 50 to 75%, while shortening the construction schedule and carrying costs.

The focus will follow the rise of the wooden towers and predicted sky scrapers that will soon replace the traditional structures of concrete and steel in the skyline of our cities. It will contain a short historical perspective of the evolution of wood building through the ages and will try to enlist some basic characteristics of the new typology of materials and structures. The paper will also contain case studies followed by a short analysis of the main features of this kind of buildings.

Contemporary architecture calls for wood as a reference element, because of the various possibilities that it offers for fast and applicable constructions, advanced structural solutions, sustainability, low-costs and great availability. As it is the only renewable structural material, wood is often postulated as the construction material of the future — in can offer solutions with competitive prices, means of building in places with few natural and economic resources, covering the entire demand especially in emerging economies. We will further investigate the main highlights that certify wood as an optimal material for a qualitative architectural solution, with a powerful statement of sustainability.

We will follow also the trends that prove the efficiency of this structural systems that reached their peak simultaneously with the development of industry, the improvement of execution and the rise of BIM systems design type.

Environmental specialists consider of maximum importance the need to urgently balance the cycle resources/consumption for a judicious use in order to reduce the adverse effects of climate change and adequately respond to the main concern of our times - the fast growing

[1] Roland Schweitzer, Wood in the Art of Construction, in Techniques & architecture - Bois 1Structure, no. 476, feb. march 1995, p. 30.

urbanization and the uncontrollable development of world's population. Contemporary architecture must adhere to sustainable principles and be developed in close connection with environmental issues and a mature development.

Known facts and theoretical results from using natural materials and renewable resources clearly demonstrate the possibility of creating a harmonious architecture as well as to meet both economic considerations and durability principles. The paper concludes that contemporary architectural discourse rediscovers solutions from the vernacular architectural background especially regarding the reliability of natural materials and constructive structures.

**Keywords**: tall wood, sustainable design, wood architecture, energy efficiency

„Wood has a wonderful material plasticity... Wood, the first material used for construction by man is desirable for many of the structural elements of the building. [...] But new times need new forms ... We must live wood in a new way, rediscovering it, remodeling it from its essence without imitating new forms that no longer meet our needs”[2], said Walter Gropius as he revealed the mesmerizing values of this material, which is highly used in modern architecture; since him, passing through Alvar Aalto and Japanese architecture, wood has been rediscovered, reused, revalued and placed in privileged position in high-tech structures and sustainable architecture during the last decades. He brings a noble touch to contemporary architecture, through the warmth and materiality of natural elements, as well as the transparency of aesthetical performances of a certain constructive character.

Wood is a modern material, even though his use is literally ancient; together with clay, wood is known as one of the first means of construction. Nowadays, its iconic image as a solid box, with advanced insulation is built with careful consideration for details and with great dexterity, either as a fragile-abstract ensemble or as an archetypal message that revokes the mystery of mythical forests. The present work aims to explore the main trends in the use of wood, as different situations occur in contemporary structures that focus on promoting sustainable perspectives.

Old and new reflections of wood in constructions: **Image I-01**: Wood Church of Maramures, in Sighetul Marmatiei, from the Village Museum and **Image I-02**: Picture taken during the finalization of a contemporary house with a mixed structure of cross laminated timber and massive wood logs –designed by TECTO Arhitectura. Source of images: Arch. Sergiu Petrea personal archive.

[2] As mentioned in Arhitext Design – Lemnul, no. 1.din 20/Febr 2003, Editated by UAUIM and Arhitext Design Foundation, București.

The versatility of woodwork makes it suitable for a very large range of building, from homes to public buildings and industrial facilities, bridges and infrastructure constructions tuning wood into an essential element throughout the history of architecture. Statistics show that U.S alone built each year around 1.25 million wood houses. This choice is justified by the highly reduced costs (comparing to the traditional construction systems that rely on materials obtained through a complex industrial process), but also by the fact that wood is a lighter material thus easier to maneuver. Contemporary architecture calls for wood as a reference element, because of the various possibilities that it offers for fast and applicable constructions, advanced structural solutions, sustainability, low-costs and great availability, as one can easily find this raw material. As it is the only renewable structural material, wood is often postulated as the construction material of the future — it can offer solutions with competitive prices, means of building in places with few natural and economic resources, covering the entire demand, especially in emerging economies.

## 1 CONTEMPORARY STRUCTURAL SYSTEMS

We will further investigate the main highlights that certify wood as an optimal material for a qualitative architectural solution, with a powerful statement of sustainability. In a recent study Canadian Architect Michael Green introduced a new way of constructing tall buildings by using Mass Timber panels in a constructive approach called FFTT[3]. The three primary types of Mass Timber reffer to Cross Laminated Timber (CLT) made from layers of solid wood set at 90 degree orientations one to each other, Laminated Strand Lumber (LSL) made from an array of thin chips and Laminated Veneer Lumber (LVL) made from thin laminations of wood similar to plywood but on a larger scale. Various examples built with this materials all over the world in the last years prove the versatility of this kind of systems in terms of economical efficiency, structural stability, sustainability and architectural vision.

The use of wooden elements on a large scale gave birth, primarily, to quite facile constructive systems (used nowadays in certain archaic collectivities) that only involved sticking some pillars into the ground, and filling the spaces between them with wattle and clay and further sheltering the entire edifice under one light roof. This phase was followed by a new step of frame structures, commonly referred as *Fachwerk*, with vertical and horizontal elements, *with* lattices in between which one would fill the voids with wattle, clay or sometimes even parts of bricks. Geodesist George W. Snow *achieved* in 1832 with his *balloon frame* a prototype that can be found even today in the structural plans of dwellings all around the world. This comes as a natural evolution derived from prior frame structures, with the particularity that it replaced pillars and braces with large boards that could be bonded to one another with industrially prefabricated nails, allowing an increased flexibility when it came to dimensioning and placing voids. As the rest of traditional structures, *balloon frame* can be realized even in contexts of modest manpower and reduces budgets. This evolved into the *platform frame system* in which the vertical support elements have a floor height and are attached to each new level on the same position as the shaft below. The system had a great influence for the contemporary development of timber construction industry and it is still widely used in the U.S., particularly for small low-rise buildings.

[3] MGB ARCHITECTURE + DESIGN, Equilibrium Consulting, LMDG Ltd, BTY Group - THE CASE FOR TALL WOOD BUILDINGS. How Mass Timber Offers a Safe, Economical, and Environmentally Friendly Alternative for Tall Building Structures, 22nd of February 2012 version, published online - http://cwc.ca/wp-content/uploads/publications-Tall-Wood.pdf.

Amid the spectacular development of the sustainable architecture (influenced by the specter of reducing the *carbon footprint*[4] of the buildings, revertible processes and maximized efficiency, while reducing construction costs and saving resources), new products have arrised, which combine in a better way the wood performances with structural systems specific for other materials. The main goal was to obtain sustainable economic constructions, similar to classical systems, but to render them less massive and at the most advantageous price.

**Image I-03**: Three visionary ptojects using CLT structural systems that are to be build in the next years in Danmark, designed by the Danish studio C.F. Moeller - http://www.cfmoller.com/ and presented at a conference on wood buildings topics held during BAU Muenchen 2015.

The projects illustrate a way of building on higher standards by using traditional materials following a new architectural approach. The wooden modular structure is based on reinterpreting vernacular techniques, supplemented by advanced CAD software, while the exterior volumes with their unique unconventional beauty are greatly influenced by the principles of sustainable architecture.
Source of images: Arch. Sergiu Petrea personal archive.

Prefabricated elements have a high degree of serialization and typology thus the system is so advanced that construction can be fully disassembled and reassembled each time elsewhere. So the use of construction wood and glued laminated timber widely spread in a large variety of shapes and sections of elements that became turning points for building spectacular visionary constructions.

This new type of architecture follows the principles outlined by Werner Sobek as defining for contemporary buildings. The German architect identifies three sustainable design strategies

4 Carbon neutrality or zero carbon footprint refers to achieving zero net carbon emissions by balancing the measured quantities of carbon released with an equivalent amount stored or compensated. The term usually refers to processes that produce large amounts of carbon dioxide, associated with construction activities, transport or energy and industrial production.

that match our analysis, based on principles important for optimizing material consumption and reducing the emissions and waste resulted during the construction process[5]:

- *Materialleichtbau* (building with lightweight materials) refers to the optimum percentage ratio of material's performance (such as strength and elasticity) and its specific weight. The consumption is reduced proportionally with the degree the material used for structures or enclosures is lighter and more durable.
- *Strukturleichtbau* (building with lightweight structures) refers to the use of accepted minimum weight structures that have specific structural requirements. The principle refers to structural systems that have only loadbearing purpose and are sized only for this role.
- *Systemleichtbau* (building with lightweight systems) refers to adaptable systems, modular and with low specific weight, which can take as many tasks simultaneously within a building.

Usually mass wood structures offer a great number of important advantages for a sustainable and economic efficient architecture:

- Have a higher load carrying capacity without increasing the weight of the items.
- Have a high resistance compared to traditional wood, with a nearly homogeneous physico-chemical structure, so there are no structural deformations present (shrinkage, cracks).
- They are economical material that can be processed simply, efficiently and quickly, therefore they have a high degree of standardization and modularity.
- There are no environmental impact while using them and they have a visibly pleasing and natural appearance.

Contemporary systems find themselves in a continuous evolution, which leads to a qualitative progress of the structural solutions one applies in architecture. Software development, computer-aided design and various methods of simulation and optimization of the generated constructive elements allow new approaches of working with wood. Construction techniques are often dependent to prefabrication and serialization in order to efficient building components designed according to the span and load. As a result of numerous options of advanced woodwork methods (including CNC systems, three-dimensional printers, special finishing machines etc.) some of the elements can easily be prefabricated so that they would be transported and assembled on site in the shortest possible way. This process comes as a consequence of humans' need to streamline the production and shorten the execution time in order to accelerate the building process and stabilize the profit that is strongly affected by harmful factors such as financial problems or climate changes, etc. As a conclusion, we can assert that sizing the wood profiles and choosing optimal system depends less and less on the skills of the carpenters and secrets exchanged between casts of constructors and instead it is subordinated to well-established rules. Their efficiency reached its peak simultaneously with the development of industry, the improvement of execution and the rise of BIM systems design type[6].

The trend of increasing urbanization around the world calls for alternative safe techniques to build tall buildings in a carbon neutral manner. Wood as the only renewable building material

5 Werner Sobek in Architecture isn't here to stay. Towards a reversibility of construction published in Ilka Ruby & Andreas Ruby, Re-inventing Construction, Ruby Press, Berlin, 2010, p. 35.

6 Building Information Modeling [BIM] is a computer generated representation of the functional, physical, structural and technological characteristics of a building. The result is summarized in digital form and becomes part of a database that is open to all that are interested in the design and execution stages in order to provide permanent control. Also, as a direct purpose, it has the possibility to take better decisions from early design stages of a project and also throughout the design and implementation/construction phases. The process requires extensive monitoring for the entire physical life of a building, its use and the final stages of demolition/conversion/recycling procedures.

– as long as it comes from sustainable managed forests – is a key factor to achieve new standards of sustainable living. One of its major benefits comes from a potential foundation cost savings which can be realized if soil conditions are poor since a mass timber wood structure is lighter than a conventional structure of a steel or reinforced concrete building. Therefore there can be required less effort and material to build the foundation without any compromise to the structural integrity of the overall project. Another benefit is the potential savings from the speed of erection of the structure and a quicker overall construction process. This is possible only if the buildings' design, system integration and material selection rely on a high degree of offsite prefabrication.

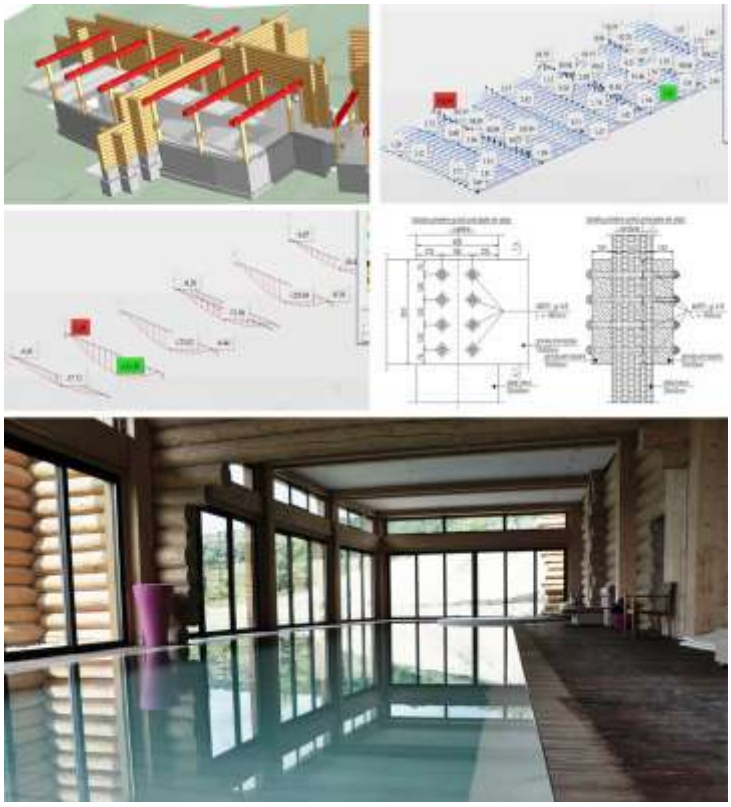

**Image I-04:** Sustainable home on wood structure. The Architectural design was aided by the computer through complex simulations in order to permanently check the stability of the constructive systems and of the interrelations between all elements. This allowed us to avoid the use of classical braces and obtain large openings that go together with generous spaces and flexible interiors. Elements of cross laminated timber are working along with walls of massive logs, placed perpendicular in the heart of each body. As they are made of uncalibrated green wood, they are subject to the phenomenon of subsidence; emerged as a result of natural drying over time and therefor all the joints between the logs and BBS are flexible in order to allow the vertical movement without affecting the structure of resistance through a mechanical ingenuity. –designed by TECTO Arhitectura.

Source of images: Arch. Sergiu Petrea personal archive.

## 2 SUSTAINABLE ASPECTS

Trees extract carbon dioxide from the atmosphere and store carbon, producing oxygen during photosynthesis. Using wood clearly outperforms other traditional building materials such as concrete or metal when considering the life cycle of elements (in terms of carbon balance, following a *cradle-to-cradle design*[7] procedure). Because raw wood is a carbon neutral material its use for construction becomes a highly desirable option for a sustainable building approach. Even when it is produced mechanically, as resulted from an industrial process (in order to reduce material's native weaknesses) the balance of carbon footprint slightly increases, therefore its use in construction is very favorable in terms of environmental protection and the promotion of sustainable architecture. Compared to concrete, the most widely used building material for structures for our country, glue laminated timber has the following advantages: it has only 20% of its own weight, although structural capacity remains the same; causes only 20% of freight charges for transport (this is noticeable in calculating the

[7] It refers to a principle of design that considers all aspects of the life cycle of a building from producing the construction materials used through operation and until demolition/recycling of the building. This principle has been widely developed by W. McDonough W. McDonough and M. Braungart in Cradle to Cradle: Remaking the Way We Make Things, North Point Press, New York, 2002.

energy balance of the amount of embodied energy); emissions of greenhouse gases resulting from production process are reduced and so the climate balance is maintained.

A significant example of using wood as a sustainable construction material can be found in one of the projects for the reconstruction of Italian city L'Aquila, devastated by an earthquake in April 2009. The winning solution that was built consists of buildings made entirely of wood, using special solid wood panels, called BBS – an alternative name to CLT - manufactured by the Austrian company - Binderholz. Basically, they were chosen for the special seismic properties. Other reasons for which the panels have been accepted, in addition to fire resistance, rapid assembly and low cost, are the sustainable aspects related to architecture that can be summarized as follows: solid wood is active storage of CO2, a cubic meter of solid wood stores in average 800 kg CO2. A volume of 11000 cubic meters of BBS were used to design the reconstruction of L'Aquila that means 8000 tons of CO2 stored for long term. The CO2 is equivalent with the emissions of 5000 cars per year or the amount produced annually by 1000 Europeans. For the Austrian forest it took 3.5 hours of growth to replace the wood necessary for the reconstruction of L'Aquila.

| Material | Embodied Energy | Embodied Carbon |
|---|---|---|
| | MJ/kg | kg $CO^2$/kg |
| Timber (general) | 8.5 | 0.46 |
| Glue laminated timber | 12.00 | 0.65 |
| Sawn hardwood | 7.40 | 0.47 |
| MDF | 11.00 | 0.59 |
| OSB | 9.5 | 0.51 |
| Plywood | 15.00 | 0.81 |
| **Material** | **Embodied Energy** | **Embodied Carbon** |
| | MJ/m3 | kg $CO^2$/m3 |
| Glue laminated timber | 9600 | 520 |
| Steel (typical virgin/recycled) | 190320 | 13806 |
| Concrete (1:1.5:3 eg in-situ floor slabs, structure) | 2664 | 382 |

**Images I-05 and I-06**: Table showing the amount of energy embodied in the production of building materials commonly used in construction (Left). Source: http://www.willmottdixongroup.co.uk/assets/b/r/briefing-note-14-embodied-energy.pdf. Overview of a project for the reconstruction of Italian city L'Aquila (Right).

Source of images: Arch. Sergiu Petrea personal archive.

## 3 CONTEMPORARY PERFORMANCES

In regions with abundant forests from Europe and North America the traditional constructive systems were made of load-bearing walls of solid wood that had simultaneously structural role as well as an envelope purpose. They were often dependent to the constraints imposed by the intensive use of single material accessible and available in large quantities, so their volumetric shape are not significantly different even in large geographical areas or belonging to various cultures. Construction details, the order of layered elements, shape and size of rooms, including decorations applied to them were determined with precision, according to principles passed down from generation to generation, all construction elements being subjected to the same compositional logic.

The wood was until recently completely ignored by official architecture, strongly influenced by the minimalist aesthetic of exposed concrete or the emergence of steel and glass in high-tech approach. The recovery of wood as a construction material used on large scale thanks of its various aspects opens now new aesthetic territories and new volumetric geometries. Structural systems are also reinvented, being directly influenced by the principles of prefabrication and the need to satisfy, in addition to stability and strength requirements, quick and easy assembly processes. Nowadays wood building techniques relies on elements with

structural lightness and the use of accessories to achieve structural performances, refused until recently for this material: metal connectors that allow embedding system, films which ensures better physicochemical properties even under climate aggressive, cutting or drilling programs to achieve a higher plastic expressivity.

**Images I-07 and I-08:** Laminated beams with holes for possitioning side elements cut with numerical control machine based directly on CAD filess (Left). Metal connectors providing rotational stability of the wood (Right).

Source of images: Arch. Sergiu Petrea personal archive

On the other hand, wood systems have seen a steady improvement of fire resistance, reaching now a resistance comparable to that of other construction materials and surpassing metal that needs more expensive protection systems. This is because when exposed to fire the wood burns slowly and is resistant to heat propagation, thanks of the layered wooden slats in the internal structural composition, additives and the manufacturing method. The result is the development of a charcoal coating on the external side of the elements that prevents simultaneously the oxygen for reaching the surface of the wood. Through this process, the exterior wood is carbonized and protects the interior element which prevents the destruction of the constructive system in conditions in which metal structures would collapse.


**Images I-09 and I-10**. Example of using fireproof wood panels (Left) and test examples on BBS boards type for fire resistance (Right). Source of images: the author's personal archive.

Source of images: Arch. Sergiu Petrea personal archive

## 4 ENERGY PERFORMANCE

Sustainable development in contemporary architecture calls for professionals focused on the embodied energy of a building, efficient construction processes and the development of integrated resource management systems besides the increased use of renewable energy sources. We rely on the constant concern regarding this issues of British architectural bureau

Foster and Partners, whose founder held that: "We also understand the importance of studying the whole life energy patterns of our buildings – which takes into account not just how much energy they consume, but also how much is embodied in their fabric"[8], regardless of scale or program.

The main goal is planetary equity which militates for providing equal opportunities to both developed and emerging nations, to receive a fair return for the world's resources, simultaneously giving credit for a sustainable investment in their common future. This affects our profession by introducing the need to think globally and act locally. There are constantly explored specific architectural solutions generated by particular situations but simultaneously anchored in the general context. In these circumstances, the use of wood systems for construction requires the rediscovery of traditional building techniques and encourages local crafts. Contemporary wooden architecture from countries with traditional background argues for the recovery of vernacular material tectonics in order to obtain superior functional and aesthetic architectural facets and achieving higher values for comfort and durability.

Accelerated growth of world population, diminishing traditional resources and predictions that the buildings consume half of world produced energy influenced the development of new architectural concepts and constructive systems, focused to achieve low consumption values for the entire lifetime of a building: the low-energy house, passive house, Minergie, plus energy house etc. Therefore, wood constructions become an important asset in reducing energy consumption due to the particular way that easily avoids thermal bridges for the building skin, advanced possible airtightness of the envelope or the achievement of greater insulation thicknesses.

| Increasing the thermal insulation by 12 cm | | Resulted U value | Energy saving/year | Payback period of energy saved by adding insulation |
|---|---|---|---|---|
| from | to | of | of | of |
| **[cm]** | | **[W/m²K]** | **[kWh/m²K]** | **[Months]** |
| *4* | *16* | *0.327* | *4.3* | *14* |
| *8* | *20* | *0.199* | *7.1* | *16* |
| *12* | *24* | *0.171* | *9.2* | *19* |
| *16* | *28* | *0.151* | *1.7* | *22* |
| *20* | *32* | *0.134* | *1.0* | *24* |
| *24* | *36* | *0.121* | *1.0* | *27* |

**Table 1:** Energy savings payback period by adding recycled cellulose insulation to a wood building (depending on thickness).

Also increased energy costs, a shortage of raw material on a worldwide scale and accelerated global warming threats caused the rise of a new approach in tall buildings. Even politics have already reacted to this change since buildings are responsible for 40% of energy consumption and more than 50% of carbon dioxide emissions in the European Union countries. The reduction of energy needs and the increased use of energy from renewable sources are very important, not only in terms of costs or reduction of entropic greenhouse gas emissions, but also to ensure a sustainable development. Directive 2010/31/EU (EPBD2) for energy performance of buildings specifies that the Member States shall ensure that, by 31st of December 2020, all new building are “nearly zero energy buildings” (NZEB)9. The NZEB concept refers to a building that has a very high energy performance, in terms of energy needs

[8] Norman Foster in Catalog Foster + Partners, Prestel Verlag, Londra, 2008, p. 13.

[9] EPDB, Energy Performance of Building Directive, European Union, 2010, http://europa.eu/legislation_summaries/other/l27042_en.htm

and use of fossil fuel energy as well. As a consequence, the low amount of energy required to ensure proper indoor comfort all year round has to be covered to a very significant extent from renewable energy sources, wherever possible with equipment placed on-site or nearby, to reduce transportation and storage losses.

Sustainable architecture promotes active dialogue between modern trends- facilitated by the development of scientific and technological progress - and traditional principles - which call for the use of natural materials and the implementation of bioclimatic principles. Important representatives of contemporary architecture insists for the stylistic and cultural complementarity of the two issues, praising the properties of natural materials and the favorable impact on the environment of the new generated organic architecture. Returning to the use of ecological materials is usually accompanied by the use of recycled materials for insulation systems for partitions and external cladding: wood or cellulose fibers, hemp or fabric scraps, stabilized straw bales etc. In this way an entire industry has developed driven by new insights based on theoretical research regarding reducing energy consumption and improving performance and the experiments that permanently explore more advanced properties for construction elements.

## 5 CONCLUSIONS

Environmental specialists consider of maximum importance the need to urgently balance the cycle resources/consumption for a judicious use in order to reduce the adverse effects of climate change. Contemporary architecture must adhere to these principles and be developed in close connection with environmental issues and sustainable development.

Results from using natural materials and renewable resources clearly demonstrate the possibility of creating a harmonious architecture as well as to meet both economic considerations and durability principles. Contemporary architectural discourse rediscovers solutions from the vernacular architectural background especially regarding the reliability of natural materials and constructive structures.

Constant concern to include all these aspects in an optimal design approach must start from educational fields, which are the best places to study, predict and provide workable answers our actual problems of society affected by the crisis. We believe that there can be no efficient architectural in the absence of a well-developed theory to support it.

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# THE USE OF ALGEBRAIC SURFACES IN ARCHITECTURAL DESIGN

**Oana Unciuleanu**

*University of architecture and Urbanism "Ion Mincu" (ROMANIA)*
*oanaunciuleanu@gmail.com*

**Abstract**

I investigate new ways of creating shapes that can be transformed into built architecture. My research is based in algebraic surfaces, how we can use some features from the field of mathematics to broadening architects vocabulary regarding experimental design. I look into the works of artists and architects that have already used such geometry, and also the exercises made by students regarding complex shapes. My study presents the use of algebraic surfaces in creating patterns, design objects, structural shapes, and architectural volumes.

**Keywords**: Algebraic Surfaces, Architectural Design, Experiment, Mathematics, Shape.

## 1 THE FASCINATION OF NEW FORMS

### 1.1 Algebraic surfaces as a starting point

I propose that we make an attempt to distance ourselves from the old ways of conceiving the architectural form and seek innovative solutions in the process of generating forms. I have made a connection between mathematics and architecture to observe how spectacular shapes are formed in an area of interest and how we can apply them in another. As a result I have obtained new spatial configurations put into practice by new technologies and materials. I tried to explore new qualities of space, structural effects and interior organizations that have the ability to increase our quality of life, thirst for beauty and desire for knowledge.

The investigation proposed is based on algebraic surfaces. They are shapes determined by an equation that take place in X, Y and Z dimensions, which satisfy the equation f (x, y, z, = 0). The surfaces that show architectural potential are: The Clebsch diagonal cubic surface (Fig.3), Kuen's Surface, Cayley Surface (Fig.1), Klein Bottle, Bianchi-Pinkall torus, Endras Surface, Enneper Surface, Durchblick Surface (Fig.4), Kummer Surface, Herz Surface (Fig.5), DevTgt Surface (Fig.2), Fano Surface and many more. They are characterized by their symmetry, the singularities and enumerative geometry. In order to use those and surfaces, one has to apply deformations and degenerations, so they will become true architectural symbols, and not just stay in the beginning creation faze.

1. Cayley Surface 2. DevTgt Surface 3. Clebsh Diagonal Surface 4. Durchblick Surface 5. Herz Surface

### 1.2 Algebraic surfaces in relations to art and architecture

Algebraic surfaces fascinated artists since the early 20th century; these include photographers, sculptors and visual artists such as Man Ray, Gabo Naum, Barbara Hepworth, Henry Moore and Max Ernst. The shapes of these surfaces have sculptural qualities, but the real challenge is to translate these volumes into architecture.

The artist Eva Hild creates sculptures that resemble minimal surfaces, but as a surprise for the public, her works are not inspired by mathematics, but by her own experiences. The volumes describe the pressures in life that shape our world. I believe that this is a great example of how the algebraic surfaces should be handled. Architects don't have to copy the shapes and simply insert a function, they have to come with their own interpretation and reasoning of why this alternative way of creating shape is arising.

Another approach is given by the architect Hernan Diaz Alonso, who tries to create a new type of design beauty. He emphasizes the role of the grotesque created by strange shapes in order to make people react to the built environment.

Fig.6 demonstrates a simple personal experiment starting from the Klein Bottle, and transforming it into a building, by considering the surface as the body of the building, and adding structural frames that create a rhythm on the facade.

6. Personal experiment, transforming the Klein bottle into a building.

## 2 MORPHOLOGICAL APPROACHES IN ARCHITECTURE

### 2.1 The process of generating new forms

Influences from mathematics gain popularity today because it is easier to visualize such complex shapes with the help of computers. One does not have to be a specialist in mathematics to understand how to use a program that is good in creating and manipulating algebraic surfaces. There is now software suitable for representing algebraic surfaces, from which worth to be mentioned: Surfer (http://imaginary.org/program/surfer), 3D-XPlorMath (http://3d-xplormath.org/), SingSurf (http://www.singsurf.org/).

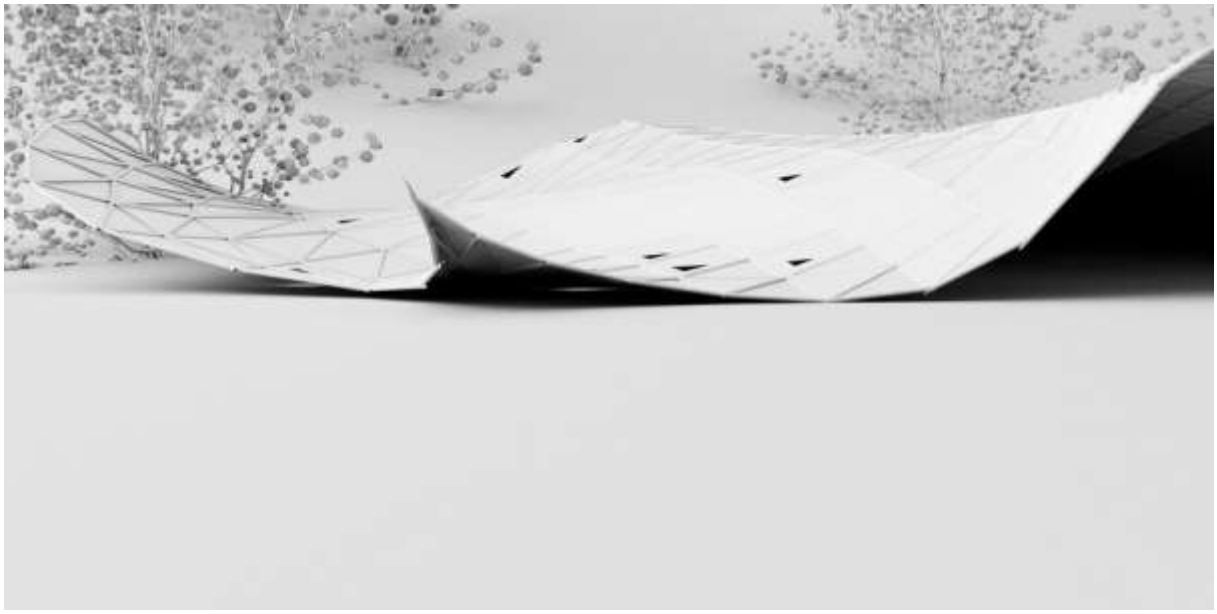
In my personal experiments I have used mostly the Surfer program, being a very fast and simple program that represents instantly the visual representation of an equation. Each surface

is determined by an equation, and by writing it into the software we have the formal result. The shape created in some programs, can be exported for further manipulations, and opened into cad programs that allow us to offer a familiar architectural interpretation.

Some of the forms obtained using algebraic surfaces are suitable for the virtual world, cyberspace. External factors related to the context and weather conditions, geological or structural factors pose no problem developing non-standard forms. From here arises the question of a link between virtual and real building structures.

"But if one is truly interested in architectural form today, the question of what, why and how are the only ones that may lead, out of the turmoil that computerized processes have given rise to, and to a level where architects once more exert some level of control over the creative process."[1] It might seem that if we, as architects, choose some shapes as a starting point of the project, don't have any participation into the creation of the volume. It is fine to find inspiration from anything, as long as there is a good reasoning to why we are doing so. The motivation for approaching the algebraic surfaces is that they are so unusual, and we can't even imagine how many possibilities for space exploration they might offer.

Fig.7 is a park pavilion that I have created using a definition that determines the elements. The same formula is applied to all of the structure, the details, creating a style of expression for this unique architectural model. The code synthesizes the shapes, the style and elegance.



7. Personal experiment, demonstrating the coherence between the elements generated by a formula.

## 2.2 Structural shape

Achieving these architectural objects is based on structural form. There is no difference anymore between the envelope and the structure, decoration and spatial organization. One rule generates all newly formed spaces, and the building is synthesized by a single equation that underlies things in small detail, but also the whole.

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[1] Agkathidis, Asterios, Markus, Hudert, Gabi, Schilling, *Form defining strategies. Experimental architectural design*, Berlin, Wasmuth, 2012, p.13.

An important feature is the inner balance of the structure. There are already buildings made based on algebraic surfaces such as: UN Studio's ”Mobius House”, Mcbride Charles Ryan's “Klein Bottle House”, Snøhetta architects “Tubaloon pavilion”, and they all show us the many faces of the relationship of interior/exterior space created by the structural shell that flows from interior, to exterior, from being a floor to becoming a wall.

### 2.3 Interior/exterior relationship

Indoor-outdoor relationship is another key factor in addressing those new forms, which permit the flow of space by tracking the continuity of surfaces from one space to another, and occurs as a breakthrough of public external space in the interior, private space, by a suave movement of sinuous loop plans.

Architecture based on mathematical shapes manages to surprise its users with creative spaces. One may sit on the shell of the structure and be on the outside of the building, but by starting to move around, he might find himself walking in a closed space of the interior. Surprises keep the users wanting to explore more of the opportunities that such shapes have to offer.

## 3 DEVELOPMENTS OF COMPLEX SHAPES INTO ARCHITECTURE

### 3.1 Equation driven architecture

Using computer software allows the understanding of these types of surfaces by people from other areas. You do not have to be a mathematician to study them, with computer programs such as Surfer; it becomes quite easy for the rest of us to approach them. Because of an interactive method of operating the program, right away we can see the connection between an equation and its volumetric shape.

The way in which non-standard architecture is thought implies a new process of phasing the work. First are defined the generating guidelines of the project, the directions of development, all the factors that influence the life of a building, the way it should be used, the materials, the context.

The second part consists of compressing this information into an equation that can change constantly. There is a shift from form-making to form-finding. The shape is designed in tandem with all the factors acting on the building. Any parameter can be adjusted and the rest of the building reconditions itself and is responding to the new requirements. Through this process, architecture becomes a dynamic system in which all elements respond to one change that occurs over time.

The methodology of creation is the factor that defines 21$^{st}$ century architecture, and not the final style of the buildings. By approaching these shapes, the equation that generates the building defines the aesthetics, but also the structural and functional sides. All three components work together in order to create a unique architectural object.

### 3.2 Advances into space generation

Experimental design that starts from the relationship of mathematics and architecture is studied in the international context, in universities such as in the Faculty of Architecture in Belgrade, the Faculty of Architecture in Dresden, Cottbus University in Germany, and Bartlett School of Architecture University in England. It is important that the new form generation concepts are studied by young people in universities because they have an opportunity to experience and discover areas of architecture untouched by others.

The algebraic surfaces can't be used per se into architectural buildings. They have to be transformed and interpreted. This is a new way of conceiving a building, because architects have to start from a shape and create a program, and not from a functional request that in the end determines the spatial necessity.

Because algebraic surfaces have no thickness, architects have to find a way to transform those shapes into solid volumes. There are a number of ways in creating this, one of which is to simply extrude the surface, and in this manner the original surface generates the floor and the ceiling of the building. This is most useful for simple curved geometries. Another way to transform algebraic surfaces into three dimensional closed volumes is by intersecting them with another shape, a prism for instance. In this case, the prism determines the outside border where the surface has to be cut. The space generated has unique attributes; it offers new opportunities for the users.

Fig.8 demonstrates a simple experiment in which I was able to transform the surface into a solid volume by extruding it. In this manner, the result can be used as a structural mesh, a facade decoration, or even if it is considered at a large scale, it can represent landscape architecture, with covered and open spaces, a link of the outside and the inside, conferring multiple surprises and ways of being used by the people exploring the space.

The quality of the resulting architectural space is given by the opportunities of use that such unusual shapes offer. Spaces don't have to be used only in one determined way. People can sit, run, stand, play, depending on the inclinations of the floor and the materials used to cover it.

8. Personal experiment, creating a thickness to a surface by extrusion.

### 3.3 Formal aesthetics

Contemporary architecture is between art and science and aims to discover new forms, unimaginable, using the technological performance of transposing shapes into built space. Architects transpose ideas from the virtual world, or the world of concepts in physical form, creating a new aesthetic.

"The formal aesthetics often emerge from the application of the rules and principles themselves."[2] The beauty of the building is given by its coherence, the elegant development of curvy surfaces and the fact that it is unique. Each building has its own geometric properties and offers to users different situations for behavior.

Mathematics is present in architecture, but most often it is hidden behind the treated volumes, and thus architecture seems more understandable. Structures, decoration, interior spatial organization, are designed together and meet the same forming conditions. No difference exists between these elements, which now represent a whole. Each element is designed to be an active partner in the equation, any element of the structure affecting the connected components. The ornament is no longer an independent factor; it emerges from combining architecture with structure, from those details. Complexity is based on interactive elements sensitive to external and internal factors of the system. Even if the design is organic, it follows a systematic logic.

## 4 CONCLUSIONS

Between mathematics and architecture there is a close relationship. Mathematics is at the core of architectural thinking, but one can observe a change in the use of concepts over time. Currently architects no longer operate with a set of pure volumes: cube, prism, pyramid, sphere and the relationship between their proportions, but today mathematics introduces new concepts, the process becomes important, the forms are the result of formulas defined by experts, including internal factors that control parameters of the building, as well as the forces acting on the building from the outside. The geometry is dynamic, as is sought and selected from a set of steps that it passes through.

In recent years one can observe a change in the approach to architectural design. More fields work together to give rise to a new product, high-tech, elegant and efficient. The architecture combines art and science in an attempt not only to keep up with the rapid pace in which society changes, but also to impose a new way to experience the urban culture.

What succeeds this type of architecture is to establish a relationship between the sculptural volume and the architectural object, between man, the user and generated space. It proposes a solution to get close to the sculptural ideal and the materialization of spatial movement.

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# THE CHROMATIC READING OF THE BUILT ENVIRONMENT

**Veronica Maria Zybaczynski[1], Anca Mihaela Constantin[2]**

[1]*"Ion Mincu" University of Architecture and Urbanism, Faculty of Architecture (ROMANIA)*
[2]*"Ion Mincu" University of Architecture and Urbanism, Faculty of Architecture (ROMANIA)*
*veronica.zybaczynski@gmail.com, constantinancamihaela@yahoo.com*

**Abstract**

The surrounding built environment is not perceived as an environment devoid of life and colour, but rather as a coloured dynamic environment which the colour, the light and the texture shape it. This article investigates the relationship between colour and built environment by addressing a number of theories about perception: from the computational theory to Gestalt principles, from neuro-aesthetics to environmental behavior studies. The reading of the built environment and of the urbanscape is in a direct and profound relationship with the individual who passed it, with his level of understanding, as well as with the factors that influence his perception.

**Keywords**: colour, perception of colour, built environment.

In approaching the issue of colour from the urbanscape point of view, a series of questions is arising, about the way in which man interprets, reads the built environment and how man relates to the colour of the built environment. The reading of the built space and urbanscape is in a direct and deep relationship with the individual who passed through it, with his level of understanding and with the factors that influence his perception (Boeri, 2010; Byrne and Hilbert, 2011).

The perception is, as Merleau-Ponty wrote (2005), not only the result of the functioning of the individual organs but a vital human action by which man, as being, perceives using relevant organs. Thus body cannot be just an object of the world, cannot detach oneself from thinking. "Understanding the means by which we aim experimentation and harmony between what we are given, between intention and interpretation - our body is anchored in the world" (Merleau-Ponty, 2005, p.144). Man is not outside the process of perception but in its center. Rapoport (1990), Ulrich (1983, cited in O'Connor, 2008) and Pallasmaa (2012) noted that the individual perception of the built environment is using all the senses (sight, hearing, smell and tactile sense), the perception being "a unique just to be talking at the same time all my senses "(Pallasmaa, 2012) and not a sum of all information received visually, tactile, olfactory and auditory. Ilona Roth (1986, cited in Robotă, n.d., p.12) provides a definition of perception considered as one of the most comprehensive: "Perception is the means by which information is acquired from the environment by means of sense organs and they experiences are transformed into objects, events, sounds, tastes, etc." This individual is one who, through perception, realized the significance of the organization, categories, systematization, relationships and hierarchies between spaces (Rapoport, 1990, Ittelson 1973, quoted by O'Connor, 2008). "Our body is the most important element of our subjective relationship with the idea of ordering the universe. [...] In comparison determine large or small, geometric and amorphous, hard and soft, narrow and broad, strong and weak, etc." (von Meiss, n.d, quoted by Meerwein et al., 2007, p.59). In the process of visual perception, according to David Marr's computational theory (1982), there are three levels of visual representations, i.e. three levels that provide information more and more detailed about the environment: primary

sketch (provides a two-dimensional description of main features of the stimulus; in this stage is detected the contour, movement, texture, colour and spatial arrangement) 2D sketch + 1/2 (at this level are processed the distance and depth, shadows and texture; this stage is dependent on the position of the observer) and 3D representation (final description, three-dimensional, of the object, independent of the position of the observer). "The first two stages are part of the primary visual processing and the last stage is part of the secondary visual processing (complex)" (Robotă, n.d.). This means that, in terms of colour, it is seen from the first stage of the formation of primary sketch, Arnheim (1974, quoted by Constantin, 1979, p.34) stating that, in general, the sight is not only ~~to~~ a direct recording of sensations, but requires also a visual judgment. "In general, we can say that the color vision starts from the object and affects the person; for the perception of form, however, extends object organizer mind" (Arnheim, 2011, p. 321). Visual judgment is made, according to *Gestalt theory* [i] (Lang, 1983), in accordance with certain principles. Essentially, the Gestalt principles[ii] are based on the tendency of eye to group together the elements of the visual field according to certain laws. The idea behind this theory is that the human eye sees the objects wholly, before to distinguish their component parts, i.e. the whole is more important than the sum of its parts. The basic concepts of this theory are: the form (which stands out from the background), field forces (psycho-biological forces, expressed in lines and planes) and the isomorphism (the relationship between neurological processes, and perceptual experience).

*The Gestalt theory*, which is intended to be applicable from the decoding of architectural and urban framework to decipher perception of patterns on a sheet of paper, was pretty much criticism. However, it is of particular interest and a starting point for architects in trying to discern what an individual perceives when driving a space (whether that space is a building or a city).

Transferrational theory (Lang, 1983), which emphasizes the role of experience in perception and focuses on the dynamic relationship between the individual and the environment, contradicts the Gestalt theory. "Transferrational theory assumes that past experiences are casted on the current situation in relation to the individual's needs, that perception is governed by expectations and predispositions and that the information obtained from the has a probabilistic nature validated through action" (Lang, 1983, p.51). In other words preference for certain patterns, proportions and meanings / significance is directly linked to individual experience and cultural information to which he was exposed or "an individual creates a world for himself" (Ittelson, 1960 quoted by Lang, 1983, p.51).

Another theory which combats the Gestalt theory is *the ecological theory* stating that "the structure of light, of sound waves, etc. can directly send information about the world without the mind to reconstruct meaningless data" (Lang, 1983, p.51). An individual who crosses the environment perceives it through the body movements and using experience he can identify the details and establish relationships, thus retaining only what is important to him, not everything. This theory confirms in a certain extent that of Henri Bergson (1920).

*Empirical aesthetics theory*[iii], focused on correlations appearing between environment patterns and hedonistic people's responses (Lang, 1983) is, to some extent, influenced by Gestalt principles.

*Neuro-aesthetics*, a relatively new branch of empirical aesthetics theories, uses neuroscience to explain aesthetic experiences, starting from the premise that "all human activity is ultimately a product of brain organization and is subject to its laws" (Zeki, 2001).

Holistic vision on man as a physical, psychological and mental being and on its relationship with the environment, addressed and developed by Viktor E. Frankl (1997, quoted in biological and physiological processes representing "the active center for physical and

material actions"), mental (emotions, feelings and acquired habits, representing "experience center") and spiritual (autonomous decisions, free will, creative ideas and aesthetics in general, representing "outbreak of perception, inner intelligence, humanity and awareness"). This approach on three levels of human actions in relation to the environment is, to a large extent, similar to the approach of Rapoport (1990) on levels of meaning, where the highest level is that of culture, in anthropological sense, and the lowest is that of day-to-day life. The environment is, however, far more than the built environment, organized in a certain way, simple spatial organization, as noted Rapoport, does not represent the environment; it requires much more, namely "organizing significance: elements (be they objects or people) are arranged in space; sizes, colors and materials that are used are necessary to communicate particular meanings" (Rapoport, n.d). A similar conclusion reached also Kevin Lynch (1990) in analyzing the perception of the city and the individual relationship with the city. The image of a city is made, according to Lynch's theory (1990), by the superposition of several individual images containing five types of elements: routs, edges, areas, nodes and landmarks.

The routes are defined as "channels along which the observer is moving routinely, occasionally or potentially. [...] For many people these are their predominant elements in the picture. People observe the city while moving through it and along these routes, depending on which the other elements of the environment are arranged and interconnected. [...] Some specific details of the facade are very important for the identity of the route. [..] Where major paths lacked identity, or were easily confused with one another, the entire image of the town was in need." (Lynch, 1990, pp. 47, 51, 52). The relationship between the individual and the elements found throughout the route and between the elements of the route read by the individual through perception generates an image of the route, which leads to the conclusion that the details, especially the color, acquires particular significance at this level.

The edges are "limits [...] linear breaks in continuity. [...] These elements, although not as dominant as the routes, are important organizing elements for many people, especially for correlation between areas [...] they are usually, but not always, the boundaries between two types of zones being employed as a side reference." (Lynch, 1990 pp.47, 62)

The areas are "parts of the city of medium size to large, designed to have a two-dimensional extension, where the observer enters <inside> and which are recognized as having something in common, an identifying character. Always identifiable from inside, they are used as an external reference when visible from the outside" (Lynch, 1990, p. 47). The physical characteristics that determine areas are "thematic continuities that may consist of an endless variety of components: texture, space, shape, detail, symbol, type of building, use, activity, inhabitants, level of maintenance, topography [...] homogeneity of the facade - material, modeling, ornament, colour, windows – could be basic clues in identifying important areas" (Lynch, 1990, p.68)

The nodes are "strategic points in a city [...] from which and into which he travels. They can be major intersections, transportation hubs, a crossing or a convergence of routes, times of transfer from one structure to another. [...] As the decisions have be taken at intersections, people are sharpening their attention in such places and perceive the area with greater clarity than normal." (Lynch, 1990, pp. 47-48, 62, 72)

The landmarks are "physically defined objects: building, sign, store or mountains. [...] They are commonly used as evidence of identity and even of the structure, and appear to be closely related and in a growing relation as the way is becoming increasingly familiar. [...] The landmarks become more easily identifiable [...] if they have a clear form, if contrast with the background, and have a specific spatial position relative to the rest of the context. The contrast target - background seems to be a main factor" (Lynch, 1990, pp.72, 48).

Lynch (1990, p.78) notes that shape, colour and arrangement are very important elements of "imageability" meaning of that "quality which gives to a physical object a very high probability of evoking a strong image for any observer" in other words, a feature, a dominant characteristic.

The city image components, identified by Kevin Lynch (1990), can be translated into lines, perimeter (s), center (s) and figure (s). Each element (e.g. route) can be approached either as a sum of parts or as a summing of components. Independently broached they have a certain value and significance in the perception of space, but taken together, like pieces of a puzzle (the city), interconnected, with certain hierarchy between them, they acquire new meanings and valuations in the perception, leading to the idea that "the whole is more valuable than the parts."[iv] It can be concluded that the user creates at his mental level, depending on some physical characteristics of the urban space, but also on the own psychological, social, cultural etc. factors, an image of the city and of the urban landscape.

Studies on the perception and evaluation of the environment built by man, on the link between the environment and the human behavior (Environmental Behaviour Studies - EBS) attempt to establish a relationship between the factors involved and the response obtained, i.e. between the social, cultural and physical environment and the human behavior, these results being used to create a built environment centered on the individual, having finally the purpose to improve the quality of life.

This field, eminently empirical, abounds in theories whose answers are partial, but which, taken together, provide a perspective on the relationship that is established at perceptual level between the individual and the built environment, and on the possible cause-effect relationships regarding the built environment and the human behavior.

Moore (2004) summarizes the main theories in this area (EBS) as follows: theory based on individual (focused on the psycho-behavioral analysis of the individual as a generator and conditioning factor of the behavior in the built environment), theory based on social groups (which starts from the idea that social rules and norms of the group determine the behavior of the individual towards the built environment), empirical theory (the central idea being that the physical environment influences the individual behavior), theory of mediation (which assumes that the physical environment determine the individual behavior through mediators), cultural theory (a particular case of mediation theory, considers that mediators are represented by culture), phenomenological theory (which is not oriented towards a direct cause-effect relationship but rather based on a more complete understanding of the phenomenon), structuralist theory (centered on the idea of the existence of structures of pattern of behavior that determine the individual response to the environment), organismic theory (which broaches the relationship between man and environment from the holistic perspective, based on the principles of Gestalt theory) and transactional theory (which considers that the interaction between man and environment is influenced both by external factors characterizing the environment and internal factors related to the inner affective and cognitive structure of the human being).

More recent theories, as those of post-structuralist kind (Moore, 2004), emphasize the instability of the relationship between man and the environment.

In conclusion, all these theories are based on certain observations and interconnections existing on the perception. Added up, these theories can provide an insight into the mechanisms of perception and can contribute to the outline of a general framework in terms of perception. Perception itself carries all the information received from the environment but not as simple data but as experiences interconnected with the social, psycho-behavioral, cultural environment of the individual.

In terms of colour perception, there exist in the human brain, as we noted above, certain rules of decomposition into simple groups to facilitate understanding of viewed items. In this context it should be mentioned Arnheim's statement (2011, p.318) that "our mind retains much harder differences in degree than differences in substance. The four chromatic dimensions we can distinguish certainly are <redness>, <blueness>, <yellowish> and gray scale." This observation is of great importance for designing a space, from the chromatic point of view, in terms of perception. Although individual holds especially, as noted above, differences in essence, the perception of ambient chromatic can be manipulated through elements such as light, distance, colour scheme etc.

Distance from the perceived object is a very important factor in the perception of the colour scheme. The perception of the colour scheme and of the colour are influenced by distance so they must be chosen depending on the desired effect in the urban space bound to the building (s). As for the inner space, the colour can change the perception of the outer space, can shrink or expand it, can zoom in or out it, can generate a sense of pressure or of stability etc. The colour is perhaps the simplest method of creating or correcting sensations directly related to public space.

On the other hand, another key issue that affects the perception of objects is relative to the observer's position, which is highlighted also by Jurov (2006). Depending on the position, the object, respectively the building (s), enter into dialogue with either sky or the background (which in the city, for example, consists of other buildings), or with one and other. For the mechanism of perception an important role is played by the visual delimitation of space and its scale, that directly affecting the chromatic perception of space.

As regards the scheme of colour application, a striped pattern (vertical, horizontal, inclined) or polychrome stains, for example, will emphasize the colour and will alter the perception of shape, while a monochrome unit model will emphasize the shape to the prejudice of colour (Rorschach, 1942 quoted by Constantin, 1979, p.36). The scheme of colour application generates a certain perception of urban space which, if controlled, can transmit to the individual those sensations and feelings that architect / urbanist wished. In addition, the colours and proportions between the colored surfaces also affect perception, leading to psychological sensations of easy-heavy, balance-unbalance, near-far, big-small[v]. Qualities of surfaces (rough-smooth, transparent-opaque, mirror, screen etc) complete the perception of colours. Rudolf Arnheim (1974 quoted by Lazarescu, 2009, p.36) stated: "the colour generates a living essentially (mostly) emotional, while shape corresponds to the (mostly) reasonable control".

Another element of overwhelming importance is the context in which the colours are perceived, "there's no point talking about a colour <as it is indeed>; it will always be determined by the context" (Arnheim, 2011, p. 329 and Anter, 2000). The neighborhood is present everywhere, whether we look at a building in nature or at one located in urban, any element is not seen detached, but in some "perceptual context" (Constantin, 1979, p.34) that enters into dialogue. Fuchs (quoted by Constantin, 1979, p.34) calls this phenomenon "equalization between chromatic surfaces" or "stimulating the neighborhood", which would means that, in the perception, surrounding areas borrow from each other chromatic characteristics so that an equalization is done (the Fuchs' experiment with colored trapezoids is well known). For Musatti (1933, quoted by Constantin, 1979, p.36) the equalization phenomenon, i.e. the phenomenon through which "the visual field is split into formal units so that each partial structure tends to become, as much as possible (in relation to the objective situation of the stimulants), homogeneous" is a primordial phenomenon.

Nasar (1994) and O'Connor (2008) advance theories in connection with the aesthetic response to the attributes of the building, considered to be a highly complex process involving individual, with psycho-social and cultural characteristics that define him: personality, affective state, emotions, cultural experiences, perception, cognitive reasoning and affective evaluations.

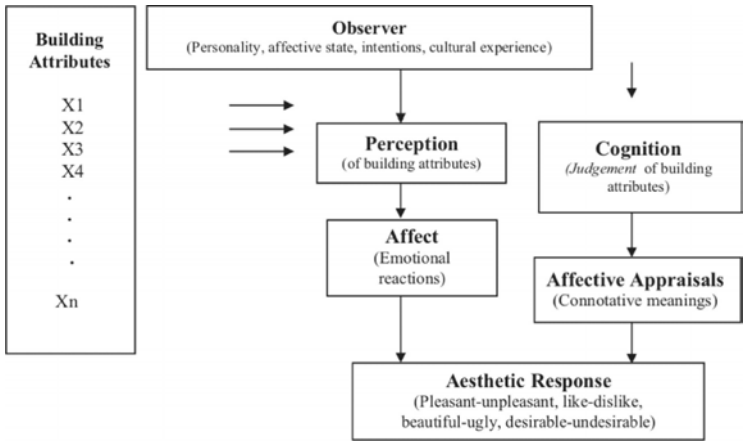


Fig.1 Probabilistic model of the aesthetic response to the building' attributes - proposed by Nasar (1994)

Studies of Unver and Ozturk (2002, quoted by O'Connor, 2008) show that in the assessment of the apparent size of a building, the colour is one of the important factors and in assessing the aesthetic quality of colour familiarity plays an important role.

Perception is thus influenced by a number of interrelated factors, both physical (light, distance, position, visual boundaries, proportions between surfaces, context) and psychological. The colour is in a direct link with the space: everything around us appears, due to perception and sight[vi], as colourful, but the colour "is shown only when it is not taken out of hiding and when remains unexplained." (Heidegger, 1995, p.71). In other words, the colour is about relationships, "about relations between it and the adjacent, between the colours and the environment" (Lancaster, 1996, p.102). The perception of colours is influenced both by its generating factors, by the physical system light-object surface-eye, and the visual experience of the individual, the way the received information is processed in accordance with the civilization and culture of which the individual belongs, with belief systems and religious rituals and with the value systems that the individual associated colour. Over time, a number of theories on the mechanisms of perception tried to explain this phenomenon, managing to outline just some partial answers, a rather general framework. Although there are certain patterns under which are created similar responses to colour, the inner structure and individual experiences greatly influence the perception so that one cannot talk about a universal response.

Summarizing, we can say that valuable judgments made by the individual on the urban landscape, and thus on the colour, are influenced by a number of factors that are purely subjective: on the one hand there is the individual reporting to his inner psycho-affective structure and on the other hand a reference to the values of the community to which he originates.

Also now, like in the past, man is surrounded by colour. The colour works at the primary perception level, that of the primary sketch, according to Marr's theory (1982, quoted in Robotă, n.d, p.12-15), the perception process being one of great complexity. In addition to the involved physical factors, with a certain level of objectivity, there are also involved the sensory, emotional factors, subjective by definition. However studies have shown that there are certain elements in relation with volumes and colour in public space having a high level of

objectivity. Gestalt theory attempted to provide a certain rigor, a certain pattern according to which space, volume, facade, in our case, can be made to provide certain information at the emotional, mental, sensory level to the individual. Although Gestalt laws do not give a full and complete definition of perception mechanism they provide a partial response with a significant value for the space creators (architects and planners). It can be extracted some conclusions and landmarks in terms of the relationship established between man and the environment, through perception:

- perception is mainly, but not totally visual. The other senses also participates actively in the perception of the environment;

- movement plays a key role in the perception of the environment, its understanding and establishment of a certain reaction at the psycho-physiological level of the individual;

- although it is very likely that man has certain patterns in terms of visual perception, patterns generated mainly by experience that he has in relation to the spaces, by its actual contact with the environment but also because of collective memory that he carries, however perception is also linked to the subjective, to the individual;

- individuals are sensitive and attentive to the elements of concern, according to their needs and desires, i.e. the perception of a space can even differ from one person to another depending on individual needs at that moment;

- "associative meanings of the environment" (Lang, 1983, p.53) and attention to details are learned.

Colour, a purely subjective phenomenon needs to be addressed according to perception. It is dependent on the observer (through the visual system - eye), the material that is applied to and the light in which it is observed. All these parameters, all this information are processed in the brain and directly influences colour perception. The colour can accentuate certain sensations and correct perception of space. Sensations of near-far, wide-narrow, tall-long, balance-instability, dynamic-static etc. offer certain keys both for creating and reading space. Colour profoundly influences people's mind, who are aware of its necessity, but its uncontrolled and chaotic existence in urban generates feelings of confusion.

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[i] Concept whose founders are Max Wertheimer, Kurt Köhler and Wolfgang Koffka, has its origins in the theories of Kant, Goethe and Hume (Wikipedia, 2013a).

[ii] Gestalt means in German form, contour, i.e. configuration, pattern or an organized area having specific properties that cannot be obtained from the sum of its parts.

[iii] Empirical aesthetics theory has four main areas: information theory, semantic approach, semiotic approach and psycho-biological approach.

[iv] This idea underlies the Gestalt principles of perception.

[v] As a rule, white and warm colours bring up and increase objects, while black and cool colours move away and diminish them.

[vi] Ciprian Mihali considers the sight as the sense of coverage and aggregation, the most fragile and abstract of the senses functioning additionally to touch in achieving the space. (Mihali, 2010)

# THE EVOLUTION OF GLASS IN ARCHITECTURE FROM A TACTILE PERSPECTIVE

**Alexandra Vișan**[1]

[1]*UAUIM (ROMANIA)*

## Abstract

Glass is the representative material of the 21st century and can be considered one of the most significant products ever to have been created by humans. Controversial and versatile, glass happens to be found at the boundary between material and immaterial, and best expresses the trend set by the dematerialization of information. Throughout time it has been associated with various values such as spirituality and technological progress. Last century's innovations were aimed not only at its transparency - glass's most important quality - but also at tangible characteristics. In terms of evolution, at the beginning, glass was used in architecture as small pieces that let light come inside. However, nowadays, the whole surface of the facade can be made of glass. Not only architects considered that glass is a fascinating material, but also artists who have experimented through time the aspects of this special product. Its visual and tactile qualities are amazing both during day and night time and this is why glass is such an important presence in our times. The large scale use of this product does not imply the absence of criticism. It is frequently lambasted due to its fragility, coldness or for its lack of scale. However, glass is more familiar to us than ever before because of the tactile screens that have invaded the contemporary city.

This paper aims to draw attention to the way in which the evolution of glass as a building material determined new possibilities of interpretation of its materiality. Although some architects consider that glass is not a tactile material because of its lack of stability and shadows, there are sufficient reasons to analyse glass from a tactile perspective. From our point of view tactility implies not only the direct contact eased by our hands, legs and skin in that very moment, but all the past tactile experiences that we had before, and, for this reason, we argue that memory plays a crucial role in architecture. The tactile qualities that glass possesses can significantly change the way we as individuals perceive the architectural space as a whole. We propose three possible types of tactile interpretations regarding glass: a profound, a superficial and an imaginary one. The first one refers to the internal structure of the material: warm/cold, smooth/rough, while the second deals with the way in which the surface of the material was realized. The last category refers to glass's ability to reflect objects, acting like a background that includes all the tactile-visual qualities belonging to the surroundings.

Another aspect that has to be taken into account regarding glass, concerns its level of transparency, which modifies the way the objects situated behind it are perceived. Even though glass is not seen as boundary in a traditional way, it definitely acts like one. In our opinion, there are three possible classifications referring to glass as a zero, partial or total boundary, each of them implying tactile aspects. The use of glass in public areas pushed the limits of physical space while the metamorphosis and innovations of materials generated new ways of conceiving and building architectural spaces. The chameleonic properties of glass are expressed through a variety of products used in constructions and ensure it a special place in architecture. Therefore this paper proposes an interpretation of the tactile aspects of glass, for a profound understanding of the architectural space.

**Keywords**: glass, tactile, profound, superficial, imaginary, boundary, metamorphosis.

## 1 INTRODUCTION

Over the last decades glass seems to have become architects' favourite building material. It is used all over the world and nowadays we cannot imagine a building without at least one piece of glass. Even though glass is being criticized because of its coldness or its lack of scale, all these imperfections disappear when its expressive implications are being understood and its full potential is being discovered.

Contemporary architecture demonstrated that glass's importance doesn't have to deal only with its role in bringing light into the buildings, but also with its both visual and tactile characteristics. Modern types of glass explore and experiment in a profound way the implications that this material has in the built environment. Do architects really understand how the use of glass in new buildings impacts upon the perception and the decoding of the architectural space? In the vast majority of cases the excessive interest for a visual architecture affects in a negative way the connection between the built object and its users.

Nowadays glass has passed its structural boundaries and brought new perspectives in the field of architecture. Windows, handrails, walls, roofs, and stairs can be made using this material. Glass seems to be one of the products that best shows the progress in the built environment and best expresses the new trends related to globalization and the dematerialization of information.

In the same time, one has to think of glass as a material situated somewhere at the boundary between material and immaterial. From the ideological point of view this product expresses the de-materialization of information and society's transparency. Its presence in architecture modified how we as human beings perceive the built space, as a result of the way the types of glass evolved over time.

The aim of this paper is to underline the variety of tactile features implied by the use of glass in contemporary architecture. New types of glass generated new possible interpretations that affect the fully perception of the architectural space.

## 2 THE EVOLUTION OF GLASS

Glass has been considered an inspiring and challenging material. Over the course of human history, artists, writers, architects have all been impressed by its qualities. Its characteristics were explored and its shades were brought into light. Glass has been related to spirituality and it implied more profound aspects that today, when one might take into discussion a loss of significance. This is generated by its large scale use. It is one of the most familiar materials nowadays, but if it is used in an insensitive and unconscious way it becomes dull and affects in a bad way how we as human beings perceive the architectural space.

Glass was discovered more than 5000 years ago, but until Romans invented special tools that helped blowing glass, it wasn't used in architecture [1]. This new material was appreciated for its quality of leaving the light of the sun passing through its mass. An important aspect that we have to take into account is that the first samples of glass were not 100% transparent. One might say that glass's evolution has to do with the finding of the pure transparency but nowadays this clear and cold material deals with many other characteristics that do not imply only visual aspects, but tangible ones.

Fig. 1 Pieces of glass: Batllo House, Barcelona - architect A. Gaudi - photo: A. Vişan -2009;

At the beginning windows were realized using small pieces of glass. Fig.1. In the Middle Ages glass was seen *„as a magic material through which light can pass without breaking it"* [2]. One of the most important moments in the history of glass is considered to be Gothic architecture period. Glass changed at that moment the quality of the interior architectural space in terms of lighting. Both structural elements made by stone and the colourful windows made by stained glass were defining the spectacular cathedrals' space, collaborating and accentuating its features. Fig.2.

Fig. 2 Stained glass: Santa Maria del Mar cathedral, Barcelona - photo: A. Vişan - 2009;

As every material, glass had its ups and downs but in the last 150 years the evolution of this product was amazing. Until the 20th century glass was not able to express its *"full constructive potential"* [3]. The Industrial Revolution introduced new materials that generated new ways of building. Architecture changed dramatically pushing gravity's limits. Glass has been changing the built environment for more than a century. The architecture critic Kenneth Frampton presents in The Glass Chain: European Architectural Expressionism one of the most important aspects regarding the impact that the transparent material had. He refers to the poet Paul Scheerbart who pointed out that *„Light wants crystal"* [4]. It is underlined that glass was the material able to disclaim the closed character of the old architecture and the introduction of a new architecture based on a new vocabulary. This was what progress was seen in those times. A few decades after, the construction of Farnsworth house belonging to Mies van der Rohe and the Philip Johnson's Glass house changed the way architecture handled this cold and transparent product. These great examples of architecture best show the full potential of glass, regarding especially its visual permeability.

Nowadays glass seems indispensable in the architecture field, and this is because light is a critical element for life. In terms of production technology, after pure transparency was reached, glass started to borrow other materials characteristics as colour or texture. Almost everything can be reached due to the evolution of production techniques. Glass can embrace a variety of surfaces, colours, can play different parts, and because of its versatility this material is one of the most used in the building industry. We cannot say that evolution implied only good aspects, but negative points as well. In the past glass was regarded as a symbolic material, that today we find quite common, and we ignore the profound qualities that it possesses.

Even though its immense potential glass cannot be regarded as a perfect material. It has been criticised because of the lack of scale which introduces a distance between the human beings and the architectural objects. As Pallasmaa argues *„scale less sheets of glass...tend to present their unyielding surfaces to the eye without conveying their material essence or age"* [5]. The second critique refers to the fact that time doesn't leave its traces on glass surfaces. Its structure cannot be altered. In this century glass is more familiar than ever. It can be used almost for everything and in some cases it can have even structural purposes. Glass shapes the contemporary architectural space, a space different from what was built before because of its play of reflections and a notable lack of shadows. Fig.3.

Fig. 3 The Kursaal, San Sebastian - architect Rafael Moneo - photo: A. Vişan - 2009;

The transparent material is characterized by universality which implies both negative and positive aspects. In the first case one might say that it is a material used all around the world. The users of the built environment can recognize its qualities without even touching it. The second situation refers to the large scale used and, as mentioned before glass became a familiar, a common material. Familiarity attracted in a way problems regarding its identity and significance as a building material. As Hilsham Elkadi says: *„Contemporary architecture has, however, failed to provide glass with a cultural identity"* [15]. Despite this we want to underline that glass possesses unique characteristics in the field of building materials and in the composition of the architectural space it has to be treated in a profound way.

## 3 GLASS'S FROM A TACTILE PERSPECTIVE[1]

A superficial interpretation might conclude that glass is a material that appeals only to the eye. Its tactile qualities are not appreciated enough by architects and this is why in many cases this product is not used at its full potential. Tactility does not imply only the direct contact eased by our body, but our past experiences that involved the tactile receptors that are found all over our skin (hands, legs). It is true that our first "contact" with glass is realized through our eyes, but if we approach we are able to decode characteristics that have to do with the sense of touch, even without touching.

As we said before, nowadays we are able to build the whole shell of an architectural object using glass. This transparent and cold skin interacts with our epidermis and influence the way we behave in the architectural space. Glass plays a special role in architecture and this is because it is situated at the boundary between material and immaterial. This duality has to do with the fact that glass is *„immaterial in that you cannot see or touch it"* [7].

Many authors argue that glass is not a tactile material, but when one gets into direct contact with its surface, unique characteristics appear. Even though the process of making glass is quite common for us, we do not feel the direct connection between the transparent sheet of glass and the sand. In the field of architecture many critics, especially the ones belonging to the Phenomenological approach, consider that too much glass in buildings affected some of the qualities that characterized architecture for centuries. Glass, unlike other materials has a special relationship with light both by day and by night. Its presence opens not only a world of transparencies, but a world of reflexions that construct a different type of reality. As Elkadi argues: *„Building façades were thus losing the inherited role of the light, which in antiquity had revealed the surface's plasticity or tactility"* [8]. Stability was one of the characteristics possessed by architecture, a quality that doesn't belong to the fragile and illusive glass.

### 3.1 Tactile interpretations

In the vast majority of cases architects take into account the visual implications that glass has for the built environment. They forget to refer to it as a material and they tend to concentrate too much on its immaterial features. From our point of view a deep understanding is necessary. This implies not only the visual aspects, but the tactile aspects too. As noted before tactility doesn't always infer a direct contact because at a certain point it can be understood starting from the visual and our past tactile experiences. There are, in our opinion three possible interpretations regarding glass tactility. We might talk of a profound, a superficial and an imaginary tactile.

[1] The concepts regarding the tactile perspective were introduced in the Phd. thesis entitled "The tactile-kinaesthetic perception of the architectural space" (A. Vişan, 2014);

A profound tactile refers to the internal structure that glass possesses. We cannot associate sand with glass from a tactile point of view, but we have to take into account that this material has its unique characteristics, being smooth and cold. Fig.4. Unlike other products it doesn't reveal the raw materials that created it. As shown before, Pallasmaa argued that not showing its origin is not a good thing. Sand, water and fire are not visible in glass's structure. It is just as this material had no origin. This cold material differs from the other products used in the construction field. From the architect's Sainz point of view *"If stone is muscular mass, glass is epidermal surface"* [9][2]. Fragility is another characteristic that belongs to the glass's surface. It express that the contact with an object made of this material has to be a gentle and not a violent one, because glass might break. Ever since its invention it has been regarded as a precious and a delicate product that needed special care and treatment.

Fig. 4 The profound tactile - photo: A. Vișan - 2013;

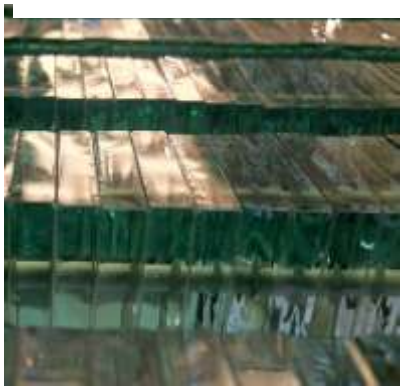

Fig. 6 The superficial tactile - photo: A. Vișan - 2013;

A superficial tactile has to do with the way in which glass's surface was treated. Nowadays a piece of glass can borrow colours and textures that belong to other materials and it can become almost anything. The process that was conducted to obtain the perfect transparency enabled the discovery of new appearances. Fig.5. Enterprises producing glass offer a large variety of samples. This material can have textures that 200 years ago were unimaginable. New types of glass show the metamorphosing ability that this material possesses. Glass is not only transparent; it can be translucent, reflective or opaque. Fig.6. Starting from this one might say that it is an ambiguous, a versatile product used for building architectural objects. The patterns that a piece of glass can get are very different and can be inspired by the organic, an-organic or geometric world. The geometry of the obtained patterns determines a variety of tactile sensations that differ from the ones that the profound tactile gives. There are cases when some contradictions might appear, but in the vast majority of cases they complete each other, generating a complex of sensations. Another aspect that has to be taken into account regarding the superficial tactile refers to coloured glass. Stained glass fascinated society for centuries and the added pigments in the process of production generated new thermal sensations possessed by glass. This material can be warm and cold in the same time. This chameleonic product borrows textures from textiles, wood, bricks, water assuming some of their characteristics, from a symbolic point of view.

Fig. 5 The imaginary tactile: Facade- St. Mary Axe, London - photo: A. Vișan - 2015;

The imaginary tactile is different from the two types that we discussed before. It is created by glass's capacity of reflecting its surroundings. In our opinion this special category of tactility refers to what can be seen in glass's plane, understanding by this both transparencies and reflections. In the first case glass allows us to see the object situated behind its plane. Fig.7.

[2] „Si la piedra es masa muscular, el vidrio es superficie epidermica", Jorge Sainz, p. 25.

Even if we cannot touch them we can see their shapes, colours and textures, generating an indirect connection with the tactile dimension. A similar thing happens in the second case. A copy of reality is recreated in the glass plane, like in a photo. Glass's characteristics, especially the ones belonging to the superficial tactile, affect the features of the reality's copy. Depending on the distance, we are no longer able to realize if what we see is the reflection or if it represents reality itself. Sometimes we may discuss of both reflection and transparency, and in that situation the architectural space is an ambiguous one, difficult to understand. Glass becomes an interesting and sometimes hard to decode background for life. This interesting material borrows and interprets all the aspects of the things situated near it, dualizing itself and reflecting characteristics related to tactile and superficial tactility of the the surrounding objects.

Fig. 7 The imaginary tactile: Facade - The Gherkin - architect Norman. Foster - photo: A. Vişan -2015;

### 3.2 Levels of transparencies

What differentiates glass from others materials used in constructions is the way it behaves, as a special boundary. From the physical point of view it can be regarded as a limit, but what makes the difference is the fact that our eyes can see beyond glass. *„The fact that we can see through glass sets it apart from other materials, makes it unusual and valuable"* [10]. As a result, we can perceive the objects situated behind this material, and we are able to detect their characteristics not only from a visual point of view, but from a tactile one, as argued before.

Fig. 8 Levels of transparency : Facade Canary Wharf London - photo: A. Vişan - 2014;

The level of transparency can affect the way we see and feel the architectural objects. Fig.8. In the built environment we can discuss about three possible levels regarding glass as a boundary: zero limit, partial limit and total limit. The first one refers to a glass that allows our sight to pass and to detect visual and tactile characteristics, as mentioned before. This implies a clear, almost 100% transparent type of glass. An interesting opinion about the use of this type of glass refers to the fact that *„Clear glass was used to enhance the beauty of other elements rather than being a beautiful material itself"* [11]. The second type of limit is characterized by an imperfect transparency that affects the images of the objects situated behind glass. In the vast majority of cases, while dealing with a translucent type of glass, we might see just the shape. In this case glass starts acting like a normal material possessing its almost tangible features. The third type of limit is one that characterizes all the other materials, the total limit. In this case we start to be aware of the material, tangible characteristics that glass posses: texture, colour, temperature.

Glass offers us a perspective that the others products used in the field of construction are not able to give: *„Being both here and there is an experience engendered by all windows, whether glazed, painted or pixelated"* [12].

One might argue that plexiglass posses the same characteristics as glass, but what differs is the way it acts in time. Glass ignores the passing of years while plexiglass suffers from the action of the external agents and has to be replaced. They act different in the case of scratches and touching them offers a different sensation. In our opinion, glass deserves to be

considered, at least for now, the best transparent material able to construct architectural objects.

### 3.3 Personal approach

The way normal people and architects relate to glass is not the same, even though both of them are users of the same architectural space. The contact between our skin and the architecture's glass shell can generate in the same time pleasure and inconvenience. It seems that normal users consider glass to be a more pleasant material for touch in comparison to architects.[3]

We, as human beings consider, in general, that glass is a cold and smooth material, but in the last years, because of the technological progress, glass has become to more than this. A new spectacular variety of features has to be explored to assure a correct and true "image" of the architectural space. is not only this but possesses a new spectacular variety of features.

Each of us possesses his or hers memories regarding the built environment and the way materials act in it. This is why another aspect has to be taken into account regarding glass, because we perceive it differently, depending on the spaces we have lived in before. Fig.9.

Fig. 9 The tactile exploration - photo:A. Vişan -2014;

Our first memories of glass establish the way we generally feel about this material. During our life we cumulate a lot of experiences with this product. We discover that it might be both cold and warm, or smooth and rough. This is why we just need to see it to be able to "feel" its tactile characteristics.

## 4 CONCLUSIONS

Architects have to understand the implications that glass has in architecture, meaning by this not only the visual aspects, but both tactile and visual characteristics. Its universal character as well as its versatility assures glass a special place in the construction field, generating expressivity.

Glass has been evolving since the moment it was discovered, and has been pushing its limits since then. Innovation in the field of construction's materials generated new ways of building and changed the way space is conceived and perceived.

Even though it is argued that glass is not a tactile material, it possesses features that belong to the tangible world. Through time it evolved and became a chameleonic, versatile product that replaced materials that had been used for centuries.

Glass's evolution can be summarised as the search of transparency, and after achieving perfect clearness, the search for materiality. The materials situated at the boundary between material and immaterial offer us extremely expressive architectural surfaces. The proposed

[3] The research for my Phd. thesis entitled "The tactile-kinaesthetic perception of the architectural space" (A. Vişan, 2014) underlined that there are some differences between architects and ordinary users regarding the way they perceive the products used in the built environment. The enquire realised on 80 persons, 40 architects and 40 non-architects showed that even though architects use a lot of glass nowadays they don't like touching it. Unlike them normal users declared that glass is their second favourite material after wood.

classifications regarding the profound, superficial or imaginary tactile and the levels of transparency emphasize possible ways of decoding glass's tactility, and underline the manner in which the material grow over time.

We consider that the tactile perspective offers a different way of understanding glass, a material that dominates the contemporary built environment and which seems more familiar than ever.

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# TECHNOLOGICAL DEVELOPMENT AND URBAN FORM – VIRTUAL SOLUTIONS FOR REAL PROBLEMS – URBAN REGENERATION AND RENEWAL

## PRESENTATION

**Assoc. Professor PhD Monica RĂDULESCU**

*Ion Mincu University of Architecture and Urban Planning, Urban Planning Faculty, Bucharest, (ROMANIA)*
*monicabirou@gmail.com*

### Abstract

Technological development has produced major transformation in urban form starting with the 19th century due to important evolution of transportation, construction and production technologies. Most of the innovative technologies have been rapidly implemented in an effort to adapt the settlements to the increasing pressure of the demand of the population working and living in urban areas. Important transformation in social, economic and environmental form occurred. After spatial dissociation, zoning, de-localization, urbanization, poly nuclear urban structure, metropolitan development, urban functional areas, new formulas for new urban activities, most of them with significant impact on the natural environment, a new era has been explored at the end of the 2nd millennium, the virtual era of the city. Development of communication, information infrastructure and equipment might be considered a solution for decreasing the pressure of human activities over the physical structure of the city, and diminishing physical impact over urban space. Electronic environment coexists with physical environment and living in the city is a dual existence experience. Is this a transitory stage towards the virtual city or is it an experiment preferred by those who can choose between traditional and mediated activities? Is the city subject to electronic equity and is the environment offering equal opportunities and chance for all the inhabitants, and how will be the city dealing with segregation and sustainable development under those circumstances? Technological evolution involves change in perception, in city image and configuration, in economic and social structure, business location, social, medical, education services, leisure generating models based on electronic and communication connectivity for people, resources, activities, production or management offering a great number of possibilities for functioning, combining, organizing, selling, shopping and living. But is this model a sustainable one? A key issue, and one of the most important strategies for decline areas is urban regeneration, representing important progress compared with revitalization and renewal techniques, towards an integrated, comprehensive approach. Dealing with job creation, job protection, accessibility to work areas for different groups, investment in infrastructure, housing, office areas, urban regeneration deals with profit generation, income production and distribution and represents a discipline situated rather under the political sciences umbrella than under the urban design umbrella due to the efforts and studies on the relation between power and population. (Roberts and Sykes, 2000, DETR, 2000). While urban planners formulate urban regeneration strategies seen as a set of visons and comprehensive and integrated actions aimed to improve economic, built, social and environmental conditions (Roberts and Sykes, 2000) it is for the architects and urban designers to translate into form the solutions formulated by planners. Urban renewal seems to be more appropriate solution to architects and urban designers dealing with physical transformation of the city, urban development or re-development while urban revitalization and rehabilitation are suggesting the need for action without formulating an approach (Coach, 1990).

The paper is exploring urban regeneration and renewal solutions as an answer to technological development impact, is providing clarification for urban designers and planners on urban regeneration, urban renewal and urban revitalization presenting results of research studies developed within last 10 years as well as conclusions provided by educational workshops and study cases in an attempt to generate adequacy, continuity integration and sustainability of research and design efforts of urban designers and planners in innovative experiments.

**Keywords**: innovation, urban form, regeneration, renewal, solutions, research projects

## 1 INTRODUCTION

The objective of the paper is to present urban regeneration as a tool for adapting cities to technological development and for strategic intervention as well. The paper intends to answer the questions related to urban regeneration and urban renewal definition - how can science, technology, innovation and creativity be placed at the service of urban policy and redevelopment? What are urban renewal and urban regeneration as tools for cities? The first part explores the impact of technological development highlighting key issues in reorganizing modern cities. The second part of the paper is presenting regeneration and renewal as tools in cities adaptation to technological development while the last part of the paper is presenting conclusions over the main characteristics of urban regeneration and renewal in Romania.

## 2 TECHNOLOGICAL DEVELOPMENT AND URBAN FORM

Technological development is one of the important factors that facilitate exchanges at a very high speed on a large scale. But although the success of globalization is widely appreciated, significant challenges need answers - poverty, inequality and polarization.

Information and Communication Technology (ICT) are often presented as tools enabling emancipation and overcoming space constraints imposed by past technology [1]. They permit the business world to develop global markets and people to form communities based on common values shared by all members. While ICT provides wealth for some people, other remained poor, having no access to ICT.

Contemporary human settlements development has two major trends. The first of these is the magnitude of the urbanization process - the largest in human history [2]. The second refers to the rapidity, strong imbalance and uneven application of information and communication technologies that connect "online" digital economy, society and culture..

The two trends are closely related. Despite all expectations, electronic communications did not blocked development and expansion of metropolitan areas, but supported this phenomenon. Both ICT and metropolitan development are elements of industrialization and globalization in modern times but the intensity and disparities of the spatial impact of ITC is critical for the development of human settlements. ICT enhance global urbanization in three distinct ways:

1. ICT enables urban centres to expand its economic power, and allows remote control of markets and territories - regionally, nationally and internationally. ICT support the acceleration of flows, contacts, transactions, communications and interactions that help linking and integrating economic dynamism in human settlements polycentric development, regions and corridors.

2. In a volatile global economy, increasing speed, complexity and risk level of innovation in all sectors seem to require a parallel concentration in cities ensuring competitiveness. This

phenomenon explains why most acute problem of urban planning processes are transport and parking. Workforce still must physically move although products are sent instantly to markets located far away using ICT.

3. Demand for ICT - mobile phones, satellite television, computer networks, e-commerce, internet services - is overwhelming and generated by overall development of urban markets, capital accumulation, higher incomes and concentration of firms and international institutions.

Complex interactions of ICT and cities are evolving in the context of evolving political and economic liberalization, of rapid technological change in the nature of national states and the internationalization of political economy.

Together, these processes of change creates tremendous challenges for the traditional understanding of cities especially on land use, form, urban design and transport, in areas that have neglected the importance of ICT in urban life.

In response to these challenges, urban research concerns in analysing ICT have become increasingly numerous.

Some issues still remain unaddressed or not enough detailed in the formulation of urban plans and strategies - for example how economic electronic mediated flows articulates with the economy of cities and the urban systems, what are the relationships between ICT application and processes of social and geographical polarization, how can urban analysis and policy formulation address the intangible electronic flow and changes in real time, performed at different geographical scales, and how formulation of urban policies could interact with cyberspace and ICT to generate creative policy initiatives that can put new technologies at the service of positive socio-economic urban development.

## 3 CITY RESPONSE IN ADAPTATION

Measures to meet the technological challenge in terms of adaptation to the new city [3] are needed while creating strategies for implementing or development of tele communication and information infrastructure is already a common practice in most countries having strong computerized environment.

Creating areas, cities or regions where telecommunication environment undertake the stress of current activities is no longer utopia, but this phenomenon continues to be carefully analysed in order to create measures and initiatives for a sustainable development.

As a result, an overall strategy for reorganizing the city and contemporary society must be based on several key objectives such as economic competitiveness; effective management and use of resources; preserving the natural environment; social inclusion; prosperity of the community.

Urban reorganization process under the conditions of an information society and a knowledge-based economy requires a better knowledge of both the overall framework for the implementation of technologies as well as a detailed knowledge of the processes involved.

Dealing with the potential of new technologies [3] should be directed to:

- filtering information on the benefits of technology and use well-founded data to fundament decision;

- eliminating initiatives generated by political or economic interests, that are not beneficial bilateral or are detrimental to the community or local resources;

- countering the " creative destructiveness" in the implementation of new technologies, that may generate environmental degradation, economic speculation or social cleavage, by formulating conservation and protection measures for resources and environment, and stabilization measures for the socio-economic climate;

- use decision making capacity for control and active participation in the process of technological integration;

- strengthen cohesion socioeconomic structures urban competitiveness in the global information system.

Confronting with the impact of technology, new administrative structures must have the following skills and competencies:

- governance of urban development by strategic decision-making and development of general development plans;

- spatial reconfiguration of the city and charting the horizons of development in accordance with the requirements of telecommunication media;

- regeneration and renewal of cities at object level as well as at administrative unit level in order to make sustainable urban development;

- coordinating the necessary infrastructure for environmental protection, economic competitiveness and strengthen social cohesion;

- decisions that are environmental sustainable, economic and social equitable, enabling and motivating all existing socio-economic structures in the city;

- measures ensuring equal access to information;

- counteracting the segregation trend of urban structures in "rich" and "poor" information areas;

- use of implemented sustainable development models that proved successful;

- allow expansion of sustainable development outside metropolitan borders, thus generating benefits for an expanded influence area of the city;

- use of regional influence to create partnerships with neighbouring settlements and thus, together, to development plans with minimal effects on the natural environment;

- enhancing sustainable development to produce urban structures characterised by bio-diversity and cultural heritage, structures sustainable economic, social and environmental;

## 4 URBAN REGENERATION OR URBAN RENEWAL?

Problems affecting cities originated or have been generated by problems affecting inner areas of the cities, by new developments within, nearby or outside the city, or by urban development characteristics related to economic opportunities, social conscience or technical capability.

Form and functioning are determined by the response the city is capable to provide or to generate to the physical conditions, housing and health standards, economic progress, change in the role of urban policy.

The response has to be given in respect to sustainable development principles and to the core concept animating sustainability – equity in accessing resources and products and services offered by the city in the public and private areas.

Dealing with job creation, job protection, accessibility to work areas for different groups, investment in infrastructure, housing, office areas, urban regeneration deals with profit generation, income production and distribution and represents a discipline situated rather under the political sciences umbrella than under the urban design umbrella due to the efforts and studies on the relation between power and population. (DETR, 2000).

Considered a vision and comprehensive integrated action, urban regeneration is providing solutions to urban problems and aims to produce a sustainable and lasting improvement of the economic, social, physical and environmental conditions within an area.

Regeneration is about managing change, while possible definitions (Roberts and Sykes, 2000) highlighted the most important characteristics - Lichfield – the need to better understand the decline process and the way someone is achieving, Hausner – stressing the weakness of short term fragmented approach based on project and missing a general strategic structure at city scale, and Donnison – new approach of problems stressing a coordinated action in areas where problems are concentrated.

While urban planners formulate urban regeneration strategies seen as a set of visons and comprehensive and integrated actions aimed to improve economic, built, social and environmental conditions (Roberts and Sykes, 2000) it is for the architects and urban designers to translate into form the solutions formulated by planners.

Urban renewal seems to be more appropriate solution to architects and urban designers dealing with physical transformation of the city, urban development or re-development while urban revitalization and rehabilitation are suggesting the need for action without formulating an approach (Roberts and Sykes, 2000, Coach, 1990).

Research conducted in several European cities [4] formulated conclusions and highlighted important messages to be considered by practitioners and local authorities as follows: *1. recognise that cities are in competition;2. focus on the wider metropolitan area (or city-region);3. work together across boundaries, sectors and professions;4. devolve real power and resources to city authorities;5. provide incentives for sustainable success;6. create attractive and balanced residential neighbourhoods;7. invest in high quality infrastructure and public realm;8. spread the benefits of economic development throughout the community;9. build permanent delivery organisations and skills;10. value the role of culture in regeneration.*

At the same time economic vitality is promoted providing a mix of uses – residential, commercial, leisure - meeting the demand of users [5] while urban policy based on mixed use is aimed to achieving social and environmental objectives, providing a compact model of development.

Sustainability of the solution provided by urban design has also been stressed as being important, as a result of the master plan for urban regeneration. In this respect, criteria [6] have been suggested such as - participatory processes, urban culture, landscape, neighbourhood relations, population density promoted, transportation network, service provision, integration of new community members and financial structure, some of them particularly important for the growing cities.

## 5 ROMANIAN REGENERATION AND RENEWAL

Romanian urbanism registered during the 20$^{th}$ century several stages [7] mixing general, global influence with local value system, decision and action manifested under juxtaposition, infiltration and replacement or implant, in successive *waves of renewal*, the ”post- Decembrist

urbanism" being *totally and wrongly assimilated to a new era of renewal* (Violeta Puşcaşu, 2000).

Frequently used in the latest urban development strategies in our country, regeneration is often misunderstood, there is no clear evidence of a better understanding of the decline process, a poor assumption of the way the city is achieving, being confronted with a short term fragmented approach based on project, lacking a coordinated action in areas where problems are concentrated. Most of the interventions seem to be formulated as urban renewal interventions and missing a general strategic structure at city scale.

Generally agreed as being an important tool, urban regeneration and renewal had been subject of university workshops within the master programs in our university.

Most of the areas, selected for university workshops and simulation of a regeneration strategy and renewal project, stressed the difficulty of achieving a compact and sustainable city and have been dedicated to the most sensitive areas such as high density residential areas (Bucharest - Crângași), economic and social polarization in a railway station area (Ploiești), impact of new development implant in a mixed use area (Bucharest Orhideea Commercial Area – Plevnei). Development scenarios used in the regeneration strategies formulated have been mainly directed towards realistic and achievable objectives related to: *improving public space and green areas - paving, planting vegetation line, urban lighting, landscaping green spaces treatment; facades renovation - façade, entrances, elevators, terraces, lobby blocks; public facilities improvement - civic centers, retirement homes, libraries; communication equipment - cables, free Wi-Fi hotspots in areas that are intended revitalized; green infrastructure development- recycling centers, rainwater reuse systems; design promoting gender and age - appropriate areas designed for all groups in the area (elderly, children, teenagers, students, housewives / women in maternity leave); programs for economic and social development, encouraging social inclusion - cultural events, workshops, regular activities supported by local government and affiliated partners; improving accessibility - stairs, ramps, elevators, favoring certain key points* [8].

Educational efforts on planning regeneration and renewal are preferable accompanied by public authority strategic thinking and action. As for the criteria ensuring sustainability of the master plan or the urban design solution, they have been rarely shared or publicly promoted for most of the regeneration or renewal projects in our country, although most of these have been generally accepted as success projects [9] or stories. None has proved solutions for adapting urban form to technological development impact in terms of ITC, mainly focusing on transportation, parking or public image issues, or thermic rehabilitation of collective housing units.

Although the last 10 years have been abundant in formulating strategies, most of these led to proliferation of form [10].without content but registering a positive influence mainly represented by an increased awareness, *better targeted public interventions*, *and built experience in dealing with strategic planning exercises*

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# URBAN, LANDSCAPE AND BUILDINGS PERFORMANCE DESIGN IN TERMS OF RESOURCE CONSUMPTION CONTROL AND CORRELATED WITH CLIMATIC PARAMETERS

**Dr. arch. Cristina Victoria Ochinciuc (1), Dr. eng. Mihaela Stela Georgescu (2), Dr. arh. Cerasella Craciun (2) drd. arch. Sonia Raetchi (3), drd. urb. Ana Opris (4), drd. arch. Radu Andone(3), drd. urb. Mihai Suarasan(4)**

(1) prof. at. "Ion Mincu" University of Architecture and Urbanism, (2) associate prof. at "Ion Mincu" University of Architecture and Urbanism, (3) drd. student in Architecture, Doctoral School SITT from "Ion Mincu" University of Architecture and Urbanism, (4) drd. student in Urbanism, Doctoral School SITT from "Ion Mincu" University of Architecture and Urbanism

## ABSTRACT

The paper aims to show how is affected urban environmental metabolism and the formation of heat island urban in residential areas in Romania, to present the specific problems of residential site, and the human relations and socio-cultural behavioral within local communities, in the sense of urban landscape performance design in the city. Awareness appearance of these areas within cities, called "urban heat islands" (UHI) dates back to 1810. Climate change are in actuality and are forecast to continue over the next 50-100 years. It is imperative for cities to adapt to these changes in climate and a delay in the implementation of actions will result in uncontrolled growth implementation costs or necessary measures will be applied too late. The coming years are expected climate risks in terms of extreme heat, floods and droughts globally. Because habitat tends to be "revenge" on his occupants, long-term urban planning is crucial in terms of developing new areas of excessive heat and improvement or disappearance of the problems in existing areas. As urban areas grow, there are changes in the urban landscape. With the decoding of sustainable development in architecture and with defining the principles of sustainable architecture was created the frame under which buildings can help to manage the UHI impact on communities, in a degree of increasingly higher. The building as a system, as it is considered today through the principles of sustainable architecture as a whole must respond to phenomena such as heat waves; buildings may be considered at the same time cause and effect in UHI analysis. Where meet two areas of building' physics and urban' physics there is one of the most important in the study of UHI. Super-isolation, proper ventilation and shading technologies can be considered challenges to sustainable buildings to respond not only to climate change, but also to the phenomenon of UHI. Is this a qualitative answer given to the residential buildings, but is not enough when we are talking about this phenomenon. A holistic approach is almost impossible, but integrated design type is already a reality. Measured ecological values of a sustainable building, are easy to control, and we find them in the norms and regulations and finaly in accounting calculations; non-material environmental values can sometimes be more valuable during use of the building. Some collective housing complexes can be considered an important demonstration for the suite of used spaces: transitional spaces,public space, semipublic space, patios, passages and atrium etc. The interior is characterized by spatial flexibility - modulated structure - functional adaptability all are situated behind insulated envelope made of performance materials in terms of energy. We talk in the same time about the urban design and buildings deign in direct response to the needs of society, and in the

terms of style of entire envelope of building as the decoration of city. From the environmental point of view of non-material values these integrates the building in architectural context. Because the building is conceived as a remember or as a signal. But envelope is responsible for building energy inefficiency. The construction details are very important. Integrated design requires inventiveness of the design team, and cooperation from the client or of project manager, knowledge and continuing education for teams builders, market measures and institutional regulations and banking.

**Keywords**: climate change, resilient, urban heat island, antropogenic, human comfort, densification

## The CONTEXT

"It is becoming increasingly clear that the twenty-first century marks a turning point in human history (Berry 1999,1988 ; Korten 2006 ; Lazlo2006 ), the outcome of which will be determined by our collective response to two intractable and intercon-nected problems that are already combining to create a perfect storm which threat-ens the human prospect (Kunstler 2005)".

The exponential growth of the world population and irreversible depletion of conventional resources are invoked by GJ Coates, Department of Architecture, College of Architecture Planning and Design, Kansas State University in the context of *climate destabilization* and dramatic environmental degradation due to human activities.

At present we consume four times as much oil per year as we discover each year, and discoveries worldwide peaked in 1965. While projections vary, it is estimated that by 2030 the world will have approximately 25 % less oil than is currently available and 50 % less by the year 2050 (Hopkins 2008-2009, 20; Pfeiffer 2004, www.peakoil.com ). Exponentially increasing world demand of resources may be explained by emerging economies of India and China. If we refer at the exponentially increasing world population is expected to grow from about 6.7 billion today to more than 9 billion by 2050.

"For the 150,000 people who currently die each year because of climate change- driven events, this grim future is already happening" says Gary Coates, and continues to say "and for the 250,000,000 or more people who will become climate change refugees by mid-century, the consequences of continued burning of fossil fuels will soon be all too real" (Orr 2009, xi).

Emphasizing the eco-technical aspects of sustainability, Newman et al. ( 2009, 55–148) list seven characteristics for the design of resilient cities, which they see as the building blocks for the creation of a sustainable society:

1. The renewable energy city. Urban areas should be sustained by renewable energy technologies at every scale from the region to the neighborhood to the building level
2. The carbon-neutral city. In order to address the crisis of climate destabilization, it is necessary to create carbon-neutral urban (and rural) environments.
3. The distributed city. Rather than relying on large-scale, centralized, and central-izing energy, water, and waste technologies, wherever possible, smaller-scale, community-based systems should be used.

4. The photosynthetic city. By “greening” the infrastructure of existing and new settlements, it will become possible to provide a significant amount of the neces-sary food, fiber, and other ecosystem services locally.
5. The eco-efficient city. By closing the loops of existing “waste” streams, cities will be able to provide a significant portion of their needs for energy, materials, and nutrients necessary for sustainable organic food production.
6. The place-based city. By creating climate-adapted buildings, towns, cities, and landscapes through the use of more locally sourced materials, it will also be possible to strengthen local economies while establishing an authentic sense of place.
7. The sustainable transport city. Only by creating more compact, pedestrian- friendly, mixed-use places to live, will it also become possible to provide renewable energy-powered options for public transit and personal vehicles.

**ARGUMENT**

Postwar Bucharest developed in respect of his historical tissue. In the first decades of communist period notice a slowdown of construction of buildings and utilities as compared to the effervescent interwar. "The buildings plomba" completes the gaps resulted from earthquakes and bombings. The only assembly Palace Hall (1960-1965) occurs in urban tissue, which remained unchanged in the downtown area. Until the 80s, attention is focused on achieving the neighborhoods construction of collective housing .

We are in 2015, the project underway DYNAMIC PUG 2015 and were established the pillars for "Bucharest Vision 2025": the city where I like to live and work, sustainable city, the city like regional motor.

Yet..... After 1990 there has been an explosive growth and incorrectly structured and managed real estate developments which led to complex problems much larger than those caused by "densification" of residential neighborhoods (from 70-80), then considered by residents negative intervention.

These new urban fabric inserts ignored criteria like cardinal orientation, so sunshine and dominant wind direction and other issues related to meteorological parameters, precipitation in winter, flooding, frost especially extreme events caused by climate change. These new relationship with the rest of the neighborhood housing areas is often conflict (or even "enclavisation") rarely indifferent. The emergence of these new residential areas resulted in amplification of existing problems, such as traffic or the insufficiency of green spaces.

This brief analysis and conclusions that we reached had sustained our research proposal: Reducing urban heat island to improve urban comfort and balance energy consumption in Bucharest (REDBHI). One of the reviewers who "weighed" our proposal made the following observation: "faster than I thinking I see at work together meteorologists and architects in a research".

**URBAN HEAT ISLANDS - Analysis of a causal chain**

Climate change, heatwaves, use of air conditioning to achieving and even exceeding the peak load can be known like the begining of the causal chain of UHI phenomenon.

In recent years, the construction areas have been significant changes in natural conditions, climate and hydrological changes of relief, all with dramatic consequences on human

comfort. Significant events in this relatively recent, have claimed more than 52,000 victims in countries of western Europe plus victims in USA, East Coast (August 2003). Processes of type thermal climate hazards (Urban Heat Island - UHI) occurs significantly in Romania, especially in large urban areas (Bucharest), in the last decade.

Urban Heat Islands phenomenon (UHI) is intrinsically linked to planning, but the variation in intensity depend of the season, geography and climate. It also speaks of a doubling of urban building cooling load and a tripling of peak electricity for cooling the interior of the building, while the minimum coefficient of performance (COP) for plants air-conditioned production can be decreased to 25% due to higher ambient temperatures (Santamouris et al. 2001). It can not be ignored problem of heat stress in situations where heat island intensity is maximum (Shimoda 2003 Osaka, Japan).

The building as a system, as it is considered today through the principles of sustainable architecture must respond in its entirety phenomena such as heat waves; buildings may be considered at the same time cause and effect in UHI analysis. The cause can be decoded at the site, the aggression manifested in land take and not least the orientation towards the cardinal points. The effect is felt by people. In an ecosystem approach to the environment, communities are considered today as an environmental resource and as vulnerable as any environmental resource. The anticipation effect in emergencies is the challenge of this project.

**OBJECTIVES and EXPECTED RESULTS**

The five partners involved in the project : University of Architecture and Urbanism "Ion Mincu", National Meteorological Administration, S.C. NEMETSCHEK ROMANIA SALES & SUPPORT SRL, S.C. ESOLUTIONS GRUP SRL and University from Bucharest, have the following objectives and expected results:

OBJECTIVES

I. Determination of regional climate disturbances due to overlapping factors Anthropogenic over natural background;
II. Urban Climate Zoning Bucharest - anthropogenic factors that generate Thermal Island Bucharest;
III. Evaluation of the thermal regime in occupied spaces without the equipment / systems artificial cooling - dynamic simulation on representative buildings;
IV. Making virtual platform GIS (GIS-R modules, GIS-energy) to forecast climate risk and energy risk;
V. Develop technical solutions for adaptation and improvement in the short, medium and long time to reduce UHI - Bucharest - urban and architectural foundation strategy in order to minimize / cancellation energy and climate risk
VI. Fitting virtual studio prediction - correction - analysis of mitigation measures UHI effects, real time warning / scenarios, training - dissemination.

EXPECTED RESULTS

a) Determination of empirical correlations between urban heat island intensity and characteristics of the urban environment - Urban anthropogenic factors.

b) Evaluation of geometric characteristics, thermal, optical, functional of reference buildings from urban climate zones
c) Defining and assessing risk indicators / climate vulnerability depending on Fanger indicators of thermal comfort .
d) Making virtual platform GIS with modules climate risk and energy required to send climate alert;
e) Design and realization of virtual studio;
f) Development Compendium of technical solutions to reduce the effects of ITU and reconfiguration sustainable urban settlements

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# EXPERIMENTING STRUCTURAL SPACE. PLAYING WITH INSPIRATION - DESIGNING FOR THE FUTURE

**Magdalena STĂNCULESCU**

*Department Synthesis of Design - Faculty of Architecture,*
*„Ion Mincu" University of Architecture and Urban Planning, Bucharest (ROMANIA)*
*magda_stanculescu@yahoo.com*

**Abstract**

In the field of architectural design, a multitude of principles guide the research. As a result of changes in the design assignments, architects increasingly carry out their profession in collaboration with other disciplines. In order to achieve the aesthetic of mobility, they must work with road and hydraulic engineers and landscape architects. This means experimenting with combined programs, constructions, water and materials, but emphatically without the loss of the architect's own role and responsibility.

With the help of engineers you can build everywhere: skyscrapers, underground spaces, under-water, on the water, in space. Possibilities are theoretically without limits, but in practice the building technology is improving also by research and experiment.

Nature has an irreplaceable value and beauty, many colours, materials and textures. If you want, you can draw on the wealth of water, sky, trees and leaves, grass, stones and rocks. As an architect, you can use materials like wood, bamboo, zinc, copper, concrete, glass and steel in compositions full of contrasts. Interesting developments in architecture are produced by those who manage to create the freedom to experiment and to work together within the fragmented practice of design and building.

The present paper is regarding the necessity of permanent investigations into the architectural and structural space, which is the main way to create innovative possibilities of erecting spaces, of enveloping spaces or even of creating flexible, interactive or mobile architectural spaces.

The experiment is able to combine technical, human and playful aspects in a single solution. The thematic for inspiration must be chosen carefully from the infinity of possibilities; the inspiration is flowing and growth only after a period of observation, followed by a period of multi-criteria analysis; workshops with teams of specialists in different domains, interviews leading to the materialization of several directions of the intervention: potential, probable, preferred; this moment initiates again discussion and assiduous research.

Whether it's about the idea contests to solve a specific urban planning or architectural situation (for example: The international competition "Bucharest 2000") [1], either about reviewing based on new assumptions of a well-known concept (for example: The International Competition launched by UAUIM in 2011 for students in architecture about the theme of housing), the experiment make certain of these possible scenarios become probable.

I chose to present in this paper, along with some experiments that led to innovative solutions selected from the international architectural practice and competitions, a few structural experiments carried out with students from the fifth year of study, in a team guided by prof. PhD arch. Mihail Cocheci, PhD arch. Mourga Panteli and lect. PhD. arch.M.Stănculescu [1].

Playing with inspiration, the students experienced with new materials for their structural projects and discovered their limitations as they went along. That led them to look for new solutions all over again. They are preparing to be designers without dogmatism. Their work has a permanent inspiring value. It shows what happens when you combine the technical with the sensorial. Architecture must appeal to all the senses and is never a purely intellectual, conceptual or visual game alone. Architecture is about combining all of the individual elements in a single concept. What counts in the last resort is the arrangement of form and emotion. The beauty of the projects lies in the combination of heavy and light, introverted and extroverted, tactile and abstract. Style is an outdated phenomenon. Architecture needs a handwriting that can write in different languages in order to be able to respond adequately to each location and assignment.

Based on my experience in teaching and research in architectural designing synthesis, I assess the importance of experiment as interface between architecture and structure, and I argue in favour of including more experiments as a designing base and also as a learning tool in the architectural studies, as interface between present and future knowledge.

**Keywords**: experiment, innovation, designing structures inspired from nature.

## 1 INTRODUCTION

Under various forms, instinctively or conscious, man always use the help of nature when carries on its activity in the construction; he observed that natural structures and shapes are well adapted to environment, being tested for thousands of years to all types of permanent or periodic loadings. The shelters of primitive men resembled as constituting and shape with those of beavers, bees, termites, birds, etc. In antiquity it has confirmed the logic and stability of the tree, which subsequently inspired shape and position of the columns in Egyptian and Greek temples and in the spatial structure of the Gothic cathedrals. For the domes of the cathedral of Florence, Brunelleschi has taken in research, the structural qualities of bird's eggshell and also the great Leonardo da Vinci was inspired by the natural world, when he invented flying machines, war machines [2]. The Russian churches dome shape is a reflection of natural forms such as onion bulb or pine cone structure. In the late nineteenth century and early twentieth century, the development in the study of biology has brought innovative ideas in architecture, a vigorous expression to this can be found in the creation of Antonio Gaudi. By studying natural phenomena such as: the termites living in the mounds, the calcareous soil erosion or the configuration of stalactites and stalagmites in caves, Gaudi created amazing building: Sagrada Familia, Casa Milla, Batlo House [3].

Fig.1. The influences of natural phenomena in the creation of Antonio Gaudi reflected in buildings like: Sagrada Familia, Casa Milla, Batlo House

The organic architecture, whose promoter was the architect H.L. Sullivan and continuator the architect F.L. Wright, emphasizes the basic idea of architectural unity and continuity between inside and outside, which is also a feature of the living world. To mention more recent examples: Guggenheim Museum in New York by the architect F.L. Wright, J.F. Kennedy Airport in New York by the architect Eero Saarinen, or Olympic Arena in Tokyo by the architect Kenzo Tange, which have shapes reminding of snails and shells [4].

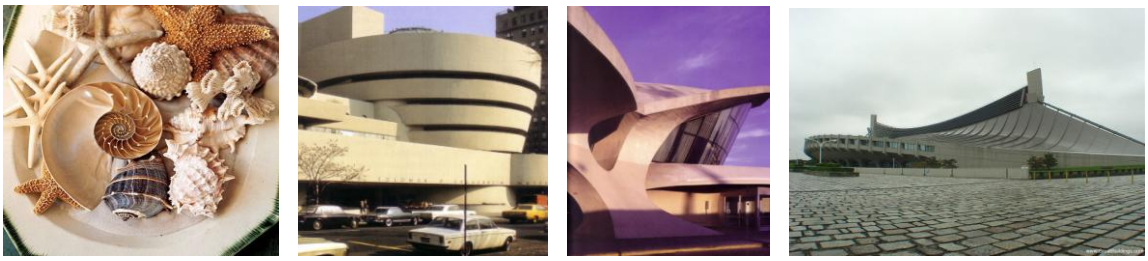

Fig.2. Spatial and formal similitude among some examples of organic architecture and snails or shells.

Introducing in architecture of the new materials for buildings and finishing - steel, glass, reinforced concrete, – is leading us to new interpretations of already consecrated forms. From the geometrical configured mineral crystals, with the deepening of mathematical knowledge, the Egyptians it were inspired to build the shape of the pyramids, but this form has been reinterpreted with modern materials and technology, by the architect I.M. Pei to the pyramid of Louvre, Paris.

Fig.3. New interpretations of already consecrated forms, are correlated to the development of technologies.

The greatest impact, however, was the development of digital technologies in the field of architectural design. With the development of personal computers, with specialized programs of architectural drawing and design, of three-dimensional model, the research about the influences of the natural world in architecture may be considered to have a new beginning [5].

This paper considers some projects carried out by students of the fifth year of study[2], which aims to understand different structural forms based on the influence of shapes inspired by nature, as reflected into diverse metamorphosis of architectural space.

## 2 METHODOLOGY

The proposed methodology is to study **functional analogies** and to compare the forming principles and means of the architecture and the natural world; It involves analyse the functions and structures of nature, through the issues posed by architecture. The analogy is a creative method called "the correspondence principle" by the physicist Bohr [6], because the principles for the construction of the form, or the form itself, are examined in correlation with its architectural utility (often study starts from solving practical problems); the achieved shapes are not simple copies from nature, represent the synthesis of principles governing the respective models.

As a creative method of theoretical and practical architectural bionics systematic research deals with the laws and principles of embodiment of living forms, applicable to architecture. The principles of the living nature, used for solving construction problems and sometimes, architectural aesthetics demands, were selected in terms of the building material and construction economy, but also to achieve outstanding performances. The bionic architectural principles may be used to solve major problems of construction endurance, such as the coverage of very large areas, the erection of tall buildings, or other special structures with good technical, ecological and economic results. Correlating functions and architectural appearance to fossil fuel economy and keeping the thermic comfort (based on “green” principles) for the duration of building exploitation, are priorities in the current architecture. *"Architectural bionics, based on methodological foundations of scientific philosophy, enriches conceptions of perception of the world through practical discoveries, as well as through mutual relationships between principles and laws characteristic for the biosphere, on one hand, and technique and architecture, on the other hand. Therein lies the innovation, originality and potential effectiveness of the method bionic " (said the Russian architect Iuri Lebedev, 1985)* [7].

## 3 THE STAGES OF THE STUDY

The study proposes to reach innovative spatial structures to be transposed in architecture in the future. The proposals should start getting a model / matrix / image which appear in natural world and embody / have influence / mimic a principle of spatial structure rather than a materialized physical space, dedicated to specific functions.

Starting from a scheme that highlights the areas proposed for study and the interference between this, it is proposed to approach steps that simultaneously synthesize the analysis of two or more issues, followed by an individual presentation and an exposition of all projects, as we can see in Fig.4.

Fig.4. Photos from the project exposition.

### 3.1 Inspiration from nature; documentation phase

The basic step in starting the study, far from being exhaustive, was the documentation of already implemented models in architecture. To name a few: inspirations with sculptural aspect proposed by architect Santiago Calatrava for Turning Torso Building in Malmo (inspired by human torso) or TGV Railway Station in Lyon (inspired by aqvila wings); the reminding structure of the tree trunks into the forest from Sendai Mediatheque by the architect Toyo Ito; architect Jean Nouvel captures the idea of geyser for the new silhouette in Barcelona: Tour Agbar [8], and many others.

Fig.5. Tourning Torso in Malmo inspired by human torso or TGV Railway Station in Lyon inspired by wings, both are works of the architect Santiago Calatrava.

### 3.2 Study: form - function

Using natural forms, is something to be done creatively; may borrow from nature the principles of construction and modelling, and in some situations the shapes, if they comply the conditions required by the building and satisfy the demands of functions that take place within them [9]. The trend of unconditionally copying natural forms, besides injury to the architecture, is reflected in conditions of human work, and implicit on the quality of the space. For example the project for the Bucharest Philharmonic, the team represented by students Vătui Ana-Maria – Petrea Irina created a complex volumetry making analogy with crystals mine; the student team Giurescu Elena – Alin Rada configured the great concert hall into an ovoid suspended above the ground [10]. By comparing sections of the performance hall, can be observed that the oval form is suitable to the function and

acoustics, while the fragmented shape of mine crystals leads to the necessity of inserting new surfaces in order to optimal reconfigures the acoustic of the space.

The study of analogies with biological environment on the basis of form and function simultaneously leads to directions applied to architecture, such as: designing tall buildings, covering large and very large openings, coating volumes with "skin", double-skin", unusual structural models such as: conquering of construction knowledge for adaptation of human habitat to new living environments - underground, on the water, underwater, in the air, in space, parasitizing other structures. The example proposed by the student Gabriela Răducu for a new model of living underground, based on the study of termite nest.

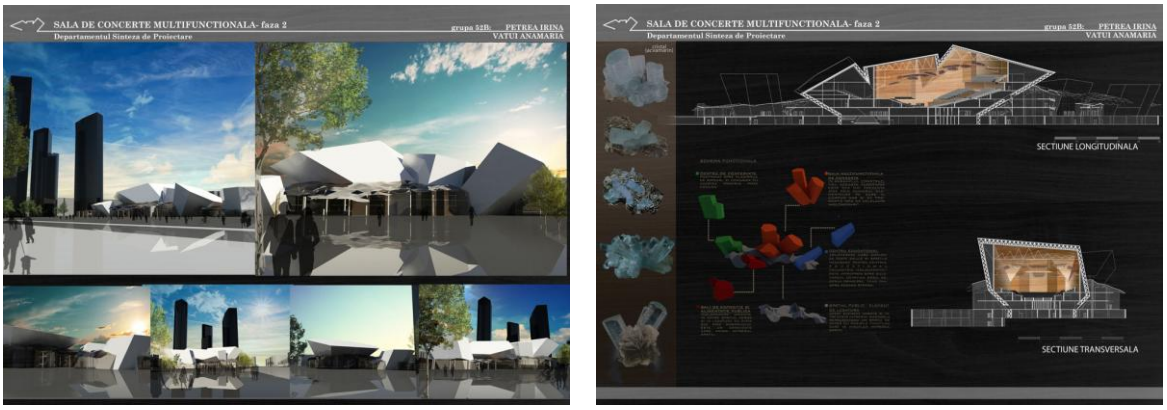


Fig.6. Project for The Bucharest Philharmonic, the team represented by students Vătui Ana-Maria – Petrea Irina.

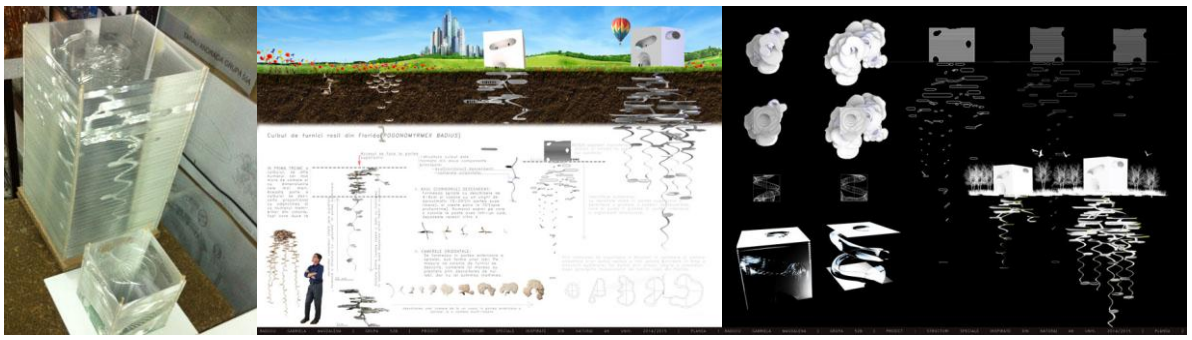

Fig.7. Project for a new model of living underground, based on the study of termite nest by the student Gabriela Răducu

## 3.3 Study: material – 3D model

Natural materials interest us both in terms of their quality for direct use or as raw material in construction, as well as their research on some properties that may lead to the creation of new artificial materials. Thin shells inspired from tubular stems of vegetable material, or oval shells inspired by from eggshell, spiral structure inspired by shellfish, twisted around on its axis for greater stability; these have already entered to the language of architectural forms, either made from reinforced concrete or steel structure and diverse facetted coatings: boards, glass, plastic. Attitude towards physical-mechanical properties of certain materials tends to change; the use of cables and thin membranes - synthetic films and tensile structures is often more effective than conventional heavy materials; water or other gasiform materials has filler role between other layers (at constant pressure) can create elastic and stable construction. However, in nature, most materials are not homogeneous, are composite and complex. Therefore is the need for innovation and inspiration by studying and producing composite or multilayer materials.

## 3.4 Study: standardisation - assemblage

In modelling of the forms inspired by nature, great importance plays multi and interdisciplinary study (mathematics, physics, cybernetics, etc.) but also intuitive side is very important. There is in nature an original standardization intrinsically linked to the economy of resources indispensable for survival and perpetuation of the species. Similarly, architecture operates on the basis of criteria such as: rationalization that leads to economy of materials and energy, standardization or repeatability of elements and subassemblies, results an easier execution. The architect Pier Luigi Nervi has used these principles when he designed two buildings: in Rome

Gatti Factory in 1951 and in Torino The Exhibition Hall in 1950, achieving great structural and aesthetic effects borrowed from the leaf of the aquatic flowers and from the spatial structure of poppy capsules. These became source of inspiration for many other architects. The example retrieved by the student Bogdan Rusu is the complex and complicated skeleton of seahorses, transposed into a structure for high buildings, with controlled spatial mobility and flexibility. Inspired by the honeycomb, as you can see in the example proposed by Paula and Sonia Nicodim, the assemblage of this various structures could cover all sorts of surfaces. Reticulation systems, ribbed constructions, three dimensional supporting structures made of fixed elements in type of latticed, grids, with fixed nodes or elastic connections, open a highly varied registry of spatial development opportunities, available to architects.


Fig.8. Project for high building by Bogdan Rusu and for various coverings, by the students Paula and Sonia Paula Nicodim.

## 3.5 Study: adaptation - flexibility - mobility

Ordering processes are suitable for the organic world that goes by a permanent disturbance, violation and recovery; due to this process, the living nature has adequate self-organization, self-development, self-moving, self-regulation. It is appropriate to mention here about some living creatures that turns into inert substances as a stage of their development. At the molecular level of the structures, living matter and the lifeless one come together, developing new qualities, blending it into a system [11]. Over some of these ideas, can be imagined models that are capable of passing from a situation or condition to another, on the principle of element's differentiation, or flexibility and mobility of a part or of the entire system. Frames and cables constructive systems have already proven qualities as forming good relations between mechanical forces and their own weight, easy to transport, permit generally non-rigid membranes for covering and it can be easily dismantled and reassembled. Examples studied by the students: Irina Petrea inspired from a spider web, propose a large roofing structure that can adapt to various types of punctual or continuous supporting; student Durlanu Adrian. debate the possibility of creating a bridge without intermediary pylons, which can be retractable by one of the supports; Smaranda Balan has developed a mobile structure inspired by the body and legs of a spider that shelters functions height from the ground, and permit variable soil coverage with the capability to change the relationship between inside and outside.

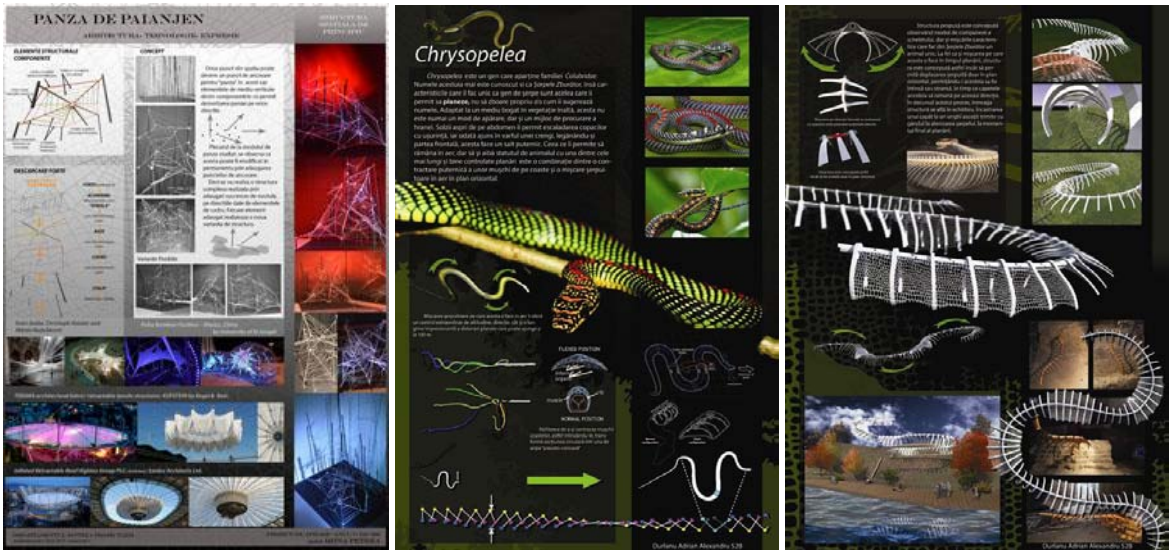


Fig.9. Project for a covering structure inspired by the spider web by stud.Irina Petrea and bridge structure by Durlanu Adrian.

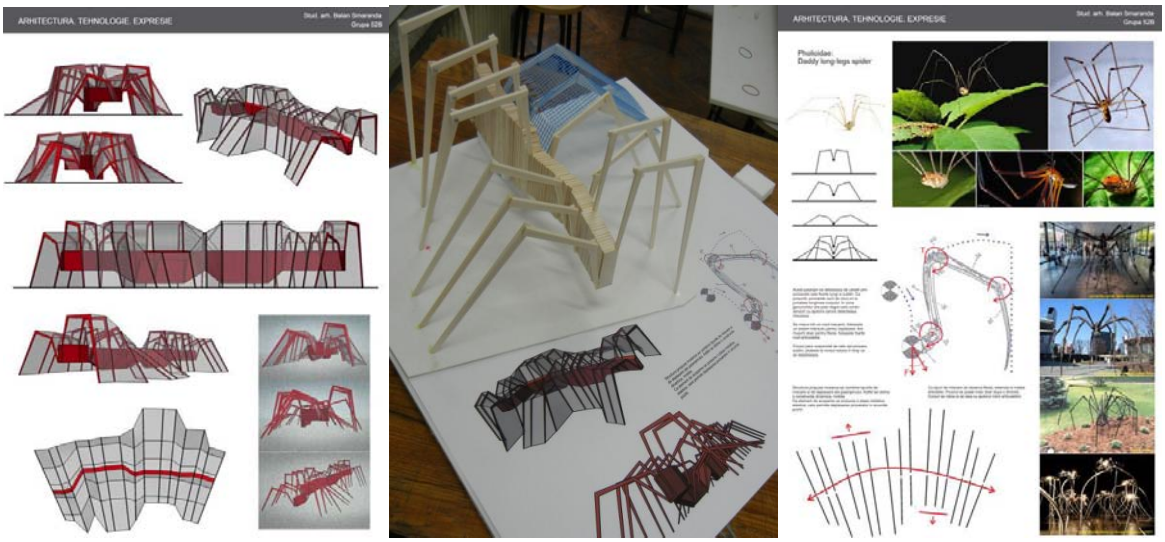


Fig.10. Project for a mobile structure inspired by the body and legs of a spider developed by stud. Smaranda Balan.

## 3.6 Study: ecology - climate - environment

With the massive growth of the urban settlements, the issue of achieving a favoured human life environment (including architectural environment), has become particularly acute. It appears necessary that the architect be able to use maximum from every advantageous situation of the environment, along with the need for isolation from adverse weather situations, in terms of economy of materials and funds. Living organisms establishes relationships with the environment, oriented to defend, to adapt, as a sensitive reaction to all changes. Contribute to this both their shape and the surface layers. Their research may enable architects and engineers to imagine and experiment structures and spaces capable to satisfy better relationship with the climatic and ecological environment [12].

The example considered by student Ana-Maria Vătui shows a covering structure with large openings space, with the possibility of folding according to weather conditions, such as a particular beetle; there are explained the possibilities to cover and un-cover big areas; student Anca Tătulescu, studying the coral reef, suggests by analogy a space for multifunctional and residential complex with adjustable coverage, also depending on climatic condition.


Fig.11. Project for a mobile structure with the possibility of folding according to weather conditions, such as a particular beetle, proposed by stud.Ana-Maria Vătui.

## 3.7 Study: aesthetic - architectural imagine

Studying the laws of nature, not only formally, requires objective, and also subjective justification; the change of scale creates problems to maintain constructive properties of the elements; is also taken into consideration the fact that hypertrophy of natural forms, applied into architecture, may adversely affect their psychology of perception. Through such an extrapolation of natural shapes, by their increasing, is important to preserve the logic of development, and recognizable characteristics [13].


Fig.12. Project for an experimental pavilion proposed by stud. Bîea Andra.

The evolution of structural expressiveness of buildings includes an extremely wide range of approaches, ranging from simple construction, dismountable, made from modest materials, up to a large-scale buildings, carried out considerable areas, that can bring to the fore a variety of complex shapes [14]. It can be seen that architectural constraints imposed both formal and constructive make the transition to unlimited freedom, embodied in a wide range of possibilities.

## 4 RESULTS

Architecture is a discipline that evolves by experience, knowledge and critical attitude. It brings together different sciences, requires the re-creation of place, context and attitude, with deeper comprehension for a future built space.

Currently the types of activities carried out in buildings can be modified, are in a permanent change; architectural programs are cumulative and are becoming increasingly complex, or conversely, tends to simplification, so that the architect is facing constantly with new situations, their knowledge gradually acquired, could not find time for experimentation and improvement. Specific design problems are influenced by technological evolution; both materials and construction techniques, known at one historical moment, affect the

achievement of structural design and architectural spaces in interdependence with aesthetic demands, generating mutations of the planimetric and volumetric forms [15]. Spatial forms appear, are maintained, disappear or reoccur in reinterpreted formulas. Even if certain models, forms and ideas have been approached, they gain one new breath with each generation of young researchers and architects [16]. The contribution of modern technologies in materials manufacturing, and possibilities to achieve constructions considered rather as challenges (the tallest building in the world, underwater buildings, construction suspended on mountain slopes, etc.) are signs that these interdisciplinary studies provide new directions for research guidance and open up new horizons of humanity.

## 5 CONCLUSIONS

Representation is vital for architectural education, being the basis for the transmission of knowledge, ideas, feelings. This process is about exploring, protecting, rehearsing and delivering ideas in a buildable form; it is about a constant research about the connections between natural world and science/erection art. By assimilating the contribution of digital technologies, structures created reassembles their own means of artistic expression, based on designs inspired by nature. In order to imagine these spatial structures, the multiple configuration of the space can be considered significant, in generating various events. May also are likely to be considered, the following: fixed location versus mobility, itinerary, light and modular structure versus classical heavy structure, the ideas of shell, skin, double-skin, the expressiveness of exteriorised structural skeleton, the environmental impact. The possibilities has no limits unless the technological progress and imagination.

The search through design also takes in account how the built environment is transformed by various innovations both in technology and in the way people use and respond to this. Searches are different, conceptually rich and try to discover other kind of relationships between image and practice. The experiment is perceived as design base, as learning tool and also as a factor of progress. Architectural education in search of the essence of things, must swing between remaining in the domain of absolute simulation or proposing a strong interaction with the real world.

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[2] 2014-2015 – "Architecture/Technology/Expression", project from Department Synthesis of Design - Faculty of Architecture, University of Architecture and Urban Planning „Ion Mincu"(UAUIM) - Bucharest (ROMANIA), in a team guided by Prof. PhD.arch. Mihail Cocheci, PhD.arch.Mourga Panteli and lect.PhD.arch.M.Stanculescu.

# VIBRATIONAL ARCHITECTURE

**Alina VOICULET**

*Faculty of Architecture, University of Architecture and Urbanism Ion Mincu (ROMANIA)*
*alina_v@msn.com*

**Abstract**

How do the buildings where we live, work, and interact, are influencing our life, mood and health?

The approach for interdisciplinary and transdisciplinary areas shows us how we can build spaces to increase the chances of being happy and healthy.
We approach these topics from the perspective of several curricular areas in order to build a more complete image. In other words, the knowledge and skills are transferred from one area to another curriculum. We are talking about cross-curricular or trans-curricular activity.
eg: Geobiology, Architecture and Vibrational Medicine – that proposing a theoretical field to become available to all classical disciplines and alternative medicine, as an understanding of intercellular communication between organs and between living beings, based on the issuance and receiving biological fields.

**Keywords**: waves, vibrational, nature, energy, sound, technology, sacred geometry, innovation, research projects

**Argument**
How do the buildings where we live, work, and interact influence our life, mood and health?

The approach for interdisciplinary and transdisciplinary areas shows us how we can build spaces to increase the chances of being happy and healthy.
The approach for these topics from the perspective of several curricular areas, in order to build a more complete image. In other words, the knowledge and skills are transferred from one area to another curriculum.We are speaking of cross-curricular activity or trans-curricular.
eg: Geobiology, Architecture and Vibrational Medicine – that proposing a theoretical field to become available to all classical disciplines and alternative medicine, as an understanding of intercellular communication between organs and between living beings, based on the issuance and receiving biological fields.

Vibrational architecture designs and builds multidimensional structures for the purpose of reintegration of the space-time relationships, natural patterns, evolutive consciousness and collective creativity. In other words the vibrational dimension in the design process articulates the following topics: vibrational phenomenology, metaphysics, mind and body experience and consciousness, multidimensional design, natural patterns and synergetic, micropolitics, collective creativity and vibrational ecology. It also addresses to the universal principles of metaphysical and cosmological ancient systems such as Feng Shui, Vastu, Biogeometry and that may also converge to a vibrational architecture.

**Research Context**

To understand the context of this research, we present some brief ideas about space-time-vibration. It can be said that everything in the universe is vibrating. Every living being is connected and influenced by molecular vibrations and the many changes of rhythm. So every living being vibrates at a certain frequency, for certain harmonic motion (energy) that produces vibrations that propagates through molecules (matter). We are part of a biological system interconnected in time and space, consisting of a plurality of layers of imperceptible molecular harmonic movements, subtle mesh of natural vibrations (such as sound, light fields, the electromagnetic telluric currents, plasma, ionosphere, cosmic rays, and more), in a continuum movement of events.

Apart from the biological level, many artificial frequencies products by the technology activities developed by the mind and body of human beings are propagated extensively in our environment, covering the entire biosphere with an invisible multilayer techno sphere (from ultrasonic waves of planes telecommunications (radio and satellite) to wireless internet, to name few).

As living beings vibrate and resonate at certain frequency patterns and quality of this report bio-resonance vibration varies depending on the environment in which we live.

So the balance of mind and our body is reflected in our health at different stages of wellbeing through: awareness, concentration, fatigue, relaxation and so on.

It follows our body's sensitivity to frequency, frequency fields perceiving auditory system, skin, nervous system, organs and the electromagnetic field. The frequencies resonate differently in each part of our body and mind and it affects us physically and mentally, often unconsciously. It's very important that different frequencies resonate between our body and space-time - see similar relationship between sound waves and acoustic space.

Formatting space-time system converts our daily activities in a specific program, invisible borders are configured in the public space, invade our privacy, control our actions, pollute the environment, and these are only a few of the effecys

What simple architectural vibrational models could balance the synergistic relationship between us and our environment? How does it manifest itself in the creative and cultural dynamics? Can it effectively contribute to the vibrational ecology?

Propose thus the exploration of architectural space at vibrational level, for learning the mechanisms of natural propagation of frequencies, universal geometric patterns, rhythms found in nature, and research ways of articulating the frequencies in basic architectural forms.

**Geobiology**, "**medicine** of **habitat**"

> *«Science qui s'occupe des rapports de l'évolution cosmique et géologique de la planète avec les conditions d'origine de composition et d'évolution de la matière vivante et des organismes qu'elle constitue»*[1]

*„Geobiology is the science of the relationships between life and the Earth's environment*."
(definition by Theillard de Chardin)

„*Geobiology is the knowledge of the condition of human life, plant and animal, subject to radiation fields, and telluric currents, natural or technological."* Dr. Ernst Hartmann.

Geobiology is practiced since forever and even Hippocrates, who died at 83 in a time (430 before J.C.) when life expectancy was hardly 25 years old, said that:

"*We cannot claim to cure a patient without taking into account his exterior environment*" !

[1] Définition selon le Larousse du XX è siècle édition 1930

**The purpose of the studying Geobiology**

Understanding the relationship between human energy fields and buildings. In principle, the orientation of buildings according to their forms, materials used, size, etc., play an important role in creating a harmonious environment or a negative aspect that affects us in terms of social, psychological, mental and spiritual areas.

The area that works with tools, cryptic techniques, devices, diagrams and totally different methodologies which aims to restore the relationship between the cosmos and man. In this transdisciplinary field can be experimental, theoretical and practical, a higher degree of harmony with the cosmos and nature. Structure designed as a microcosm, is equally traditional and contemporary, offering its occupants / users a different world, better.

Expertise is a study conducted in a professional manner, methodical and conscientious.

a. The accurate diagnostics environmental conditions and health of living organisms through non-invasive methods: bioelectrography, biolectrophotography, dowsing measurements, bioresonance.
b. Prevention
c. Remediation
d. Awareness on disasters
e. Energies and renewable technologies in support of sustainable development, sustainable remediation of environmental issues

**Gaia and Biophilia: affective ecology hypotheses.**

Author of Gaia theory (1972), James E. Lovelock, make a highly scientific demonstration, which shows that the Earth is a living organism that has huge capacity to self-regulate:

> *"Earth science, geophysiology, as the transdisciplinary environment for planetary scale problems, particularly those involving a wide range of disciplines. Where it is postulated, even though not proved, that emergent properties exist, it may be useful for practical purposes to consider the Earth as if it were a living organism.*
> *Earth as a superorganism. Like coevolution, Gaia reflects the apartheid of Victorian biology and geology, but it goes much further. Gaia theory is about the evolution of a tightly coupled system whose constituents are the biota and their material environment, which comprises the atmosphere, the oceans, and the surface rocks. Self-regulation of important properties, such as climate and chemical composition, is seen as a consequence of this evolutionary process. Like living organisms and many closed loop self-regulating systems, it would be expected to show emergent properties; that is, the whole will be more than the sum of the parts "*[2]

**Modern approach of sacred geometry**

Zeising was convinced that the Golden Section:

> *"is contained the fundamental principle of all formation striving to beauty and totality in the realm of nature and in the field of the pictorial arts, and that, from the very first beginning, it was the highest aim and ideal of all figurations and formal relations, whether cosmic or individualizing, organic or inorganic, acoustic or optical, which had found its most perfect realization however only in the human figure*"[3]

[2] Lovelock James E., Coombe Mill, St. Giles on the Heath, Launceston, Cornwall, England. Copyright 1989 by the American Geophysical Union. Published in Reviews of Geophysics 17, 11 May 1989, pages 215-222., Geophysiology, the science of Gaia

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## Geometry and Sound Therapy

> "*The modern architect is designing for the deaf….the study of sound enters modern architecture schools only as sound reduction, isolation and absorption.*"[4]

The ancient Egyptians celebrated the idea of a musical universe using harmonic proportions in designing pyramids and burial chambers.
The most ancient cultures used the seemingly magical power of sound to heal.
Healers wirinun, Aborigines healed bone fractures, muscle tears and diseases of any kind, using their musical enigmatic instrument called Yidaki.
"A sound" to be heard, requires a resonant space.

*"res•o•nance ['rɛzənəns]*
*noun*

*the quality în a sound of being deep, full, and reverberating the resonance of his voice.*
*• figurative the ability to evoke or suggest images, memories, and emotions the concepts lose their emotional resonance.*
*• Physics the reinforcement or prolongation of sound by reflection from a surface or by the synchronous vibration of a neighboring object.*
*• Mechanics the condition în which an object or system is subjected to an oscillating force having a frequency close to its own natural frequency.*
*• Physics the condition în which an electric circuit or device produces the largest possible response to an applied oscillating signal, esp. when its inductive and its capacitative reactances are balanced.*
*• Physics a short-lived subatomic particle that is an excited state of a more stable particle.*
*• Astronomy the occurrence of a simple ratio between the periods of revolution of two bodies about a single primary.*
*• Chemistry the state attributed to certain molecules of having a structure that cannot adequately be represented by a single structural formula but is a composite of two or more structures of higher energy.*
*ORIGIN late Middle English : from Old French, from Latin resonantia 'echo,' from resonare 'resound' (see RESONANT ).*"[5]

**Geometric Music Theory** is explained by the generation interval and the notes through the relationship between harmonic distances that exist between the musical notes and the planets of the Solar System. (Do-Re corresponds to the distance between Earth and the Moon, Re-Mi, the distance between the Moon-Venus and so on. So the Solar System (and in general the whole Universe) is presented to us as a great musical pentagram, where each planet emits its particular note in a wide variety of sounds.

> "*Buildings provide spaces for living but are also de acto instruments, giving shape to the sound of the world. Music and architecture are related not only by metaphor, but also through concrete space. Every building I have admired is, în effect, a musical instrument whose performance gives space a quality that often seems to be transcendent and immaterial.*"[6]

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[6] Daniel Libeskind

Holistic Architecture makes us aware of sustainable design pattern, that was rooted in our collective unconscious of thousands of years. In biology, cell morphogenesis creates form. In terms of culture, morphogenesis is creating new forms, interconnected in a planetary network. As people recover long lost memories, a new / old morphogenetic field planetary / will open.

John Elkington in The Natural House Book wrote:
"*If the Earth was a human being, hospitalized in a hospital, the forecasts would not be positive and the patient should be placed probably on a chronic list* ".

People are a whole, composed of mind-body-spirit which is in dynamic equilibrium with continuous higher energy dimensions. Tissues that make up our physical form are fed besides oxygen, glucose and chemical substance with higher vibrational energies which endows the physical properties of life.

Built in a healthy manner, means to offer to the residents of a modern habitat a healthy living environment, fulfilling more accurately the function of ecobiological mediator in the relation between man with nature. For a more harmonious integration of the object built in the environment, our intervention must be based on a holistic view that works on the principle that every element of life reflected in it contains *the whole* and tends to a state of harmony with all other elements.

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# IT WOOD BE

**Cristina Șerban**

*Lecturer, Arch, PhD, UAUIM, Bucharest, ROMANIA*
*se_cris@yahoo.com*

## Abstract

"Experiment as learning tool". As a teacher for first year of study to Furniture Design Studio in our University, starting with 2011 the students had to learn to work with wood by experiencing it in specialized craftsmanship workshop. They had to design an object or a furniture item, not bigger than a cube 40 x 40 x 40 cm, studying special wooden joints. They had also to produce their objects working themselves in the wooden workshop, together with the carpenters.

This poster will show some results and also different stages of production, explaining the theme required and some steps which were done, including their exhibitions and contact to the potential clients.

There were some few very interesting new objects created during the last 3 years which can stay anytime in line with other design items created by specialists – these products deserve to be shown in this poster / ICAR 2015's section.

Last year, in 2013-2014, we introduced a new technology by using LED lighting into this project. New ways of making the project were observed, their focus on wooden joints was distributed onto lights as well, but also other more special visual effects were achieved.

Innovative students were also choosing to combine more other technologies too – there were one loudspeaker created in 2012-2013 and another device for smart technology products as phones or tablets created in 2013-2014 in order to amplify the sound and make it loud by speakers.

Innovation was not observed just as way of combining technologies, but also as forms and functions generated by wooden technology – in 2011-2012 it was a very special product created by using traditional woodworking dovetail joints. This object had interesting architectural forms and also different ways to be used. In the same year, another product was created in such a way that its joints could confer structural stability to its product while using it, providing in the same time the possibility to ensemble/resemble it with easy.

The products were able to be exhibited in our school's stands at BIFE – Bucharest International Furniture Exhibition in 2013. In 2014 the products were exhibited in Brașov (November-December), but also in Bucharest, in June, in a public space where we could get questions like "How much it cost? Can l buy it?" These questions might be valuable to be considered in such a way that our University can plan experiments to learn and produce to sell and promote young students and the school itself.

This poster can be an opportunity to show the potential we can have and develop further. This presence of the poster to this section might lead to feedback from participants to ICAR 2015 and other audience which can be very important for taking the best decisions towards developing this idea or not (or how to do it).

It might be possible, if the space will be provided, to show also some items in real (not just the printed poster) – the single condition would be that the students should still have their

products in good condition, being able to provide them to be exhibited and/or if ICAR 2015's organizers would approve this.

**Keywords**: Wood, Natural character, Traditional craftsmanship, Technology, Quality, Ecological products, Furniture Design.

## 1 INTRODUCTION

Starting with 2011, to the 1st year of study for Furniture Design Studio in "Ion Mincu" University of Architecture and Urbanism (UAUIM) I introduced a new theme – the students have to design and produce a wooden object or furniture item, having a volume no bigger than 40x40x40cm. Main objective of this theme is to implement a new way of learning by experiencing wood and it's technologies in a specialized craftsmanship workshop (Fig.1).

Fig.1 Snapshots from ACANT DESIGN, Bucharest – students work themselves to the wooden components of their products, being continuously helped by professional carpenters.

## 2 METHODS AND RESULTS

Unlike the most common ways of studies by drawing, modelling and draft presentations of projects in University's workshops, the new learning method introduced the direct contact with real materials, technologies and production process (Fig.2).

Fig.2 – Students work with materials using adapted tools to each kind of procedure taught by the carpenters.

Working with wood in a specialized craftsmanship workshop implies safety rules and certain schedules to be respected. The working process implies certain steps according to types of materials and joints used (Fig.3). All these conditions and limits could place the students into new positions of learning by experiencing. They had to interact with carpenters and develop their woodworking skills, but also the professional relationships were new aspects that they could experiment and learn.

Fig.3 – Each type of joint or assemble operation impose steps to be followed. Adapted tools for gluing stages can be seen in the snapshots above. Assembling steps have to be established and followed accordingly; if steps are not respected there can be situations leading to failed results.

From Design point of view, the results could show the direct influence of technology to final object, affecting its form and/or functions – this being another teaching objective of the theme. The students understand better the Design thinking way that consider form, material and technology at once in the project's concept.

## 2.1 Types of joints and their results

For the 1st year of study level and being the 1st direct work with wood, we were focused to understand the joints in woodwork. According to Nick Engler in *"Joining wood – techniques for better woodworking"*, Bookworks Inc., West Milton, Ohio, 1992, classification of joints is made like: *"simple joints, such as dadoes and rabbets, require only few simple cuts to assemble two parts; reinforced joints use a secondary piece of wood, such as dowel or spline, to strengthen the joint between two or more principal parts; mortise-and-tenon joints have one part that is bored or recessed to hold a second part, and are mostly used to join the parts of a frame; interlocking joints use multiple cuts to increase the adjoining surface area, and usually join the parts of a box"*. (p.3)

Together with the carpenters, we decided to classify the joints in other way, according to the difficulty of execution and traditional craftsmanship: as simple as the cuttings were needed and as much as the students themselves could do them, we named these joints "simple". The joints most difficult to be executed by using special tools and requesting longer production time we classified as "complex" (Fig.4).

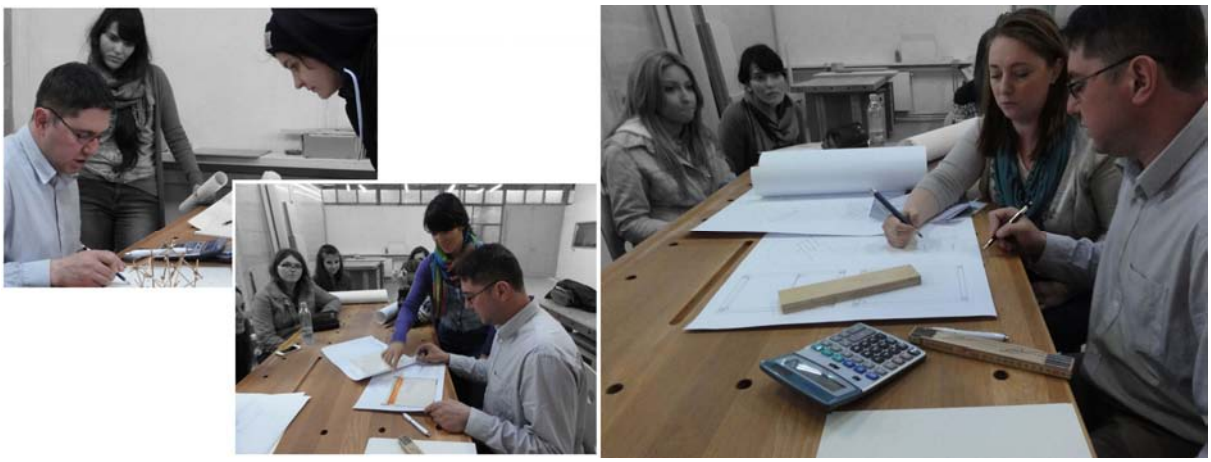

Fig.4 – Design projects are discussed with the carpenter in order to establish the execution process and types of joints that can be most appropriate to the desired results. Some technical decisions may change some parts of the project or sometimes even the concept can be influenced. A lot of woodworking knowhow can be taught during these discussions. This step is very important into design learning process for all students – group talking is important to happen at this stage.

### *2.1.1 Simple joints - butt joint, biscuit joint, dowel joint, bridle joint, 45° angle joint (mitre joint)*

Most of the projects used simple joints that require only a few simple cuts to assemble two parts. These joints are some of the most used ones into Furniture industry when it's about big series of products for lowest production costs. They can be obtained by simple hand cuts or adapted machinery, providing the possibility of students to work with them by their own with easy.

The results also showed that production is easy - there were some design limits which couldn't improve the look and details of the final product which seems very simple. Many students that used simple joints tended to think of more complex forms and functions of the same object or felt the need of graphic interventions on wooden surfaces (Fig.5). All these experiences were not necessarily leading to an improvement of their objects, but it was an obvious result for all about what is the direct link between the concept of an object and its materials, technologies, forms and functions – one of the main lessons for everyone!

Fig.5 – [1] and [2] multifunctional objects to be placed on a desk, being used for paper, pens, paperclips and other office accessories, were executed with simple cuts, drills, 45° angle joint (mitre joint) and glue. [3] Dowel and bridle joints were leading to a framed object that could keep different objects in different positions stocked. [4] Simple joints but complex concept – a functional wooden loudspeakers carcase.

Next years, the further look for other improvement ways for students' projects started to lead to the need of combining wood and its technologies with other materials and their technologies like: lacquering, upholstery, electric installations as LED lighting or audio (Fig.6).


Fig.6 – [1] and [2] were simple boxes that were getting some graphic interventions such as poker work or painting. [3] This furniture piece introduced lacquering and added an upholstery element that can increase its functions from a simple storage console to a potential sitting place. There were used halved joins for legs and simple joints for carcase. [4] By using hidden simple joints applied on MDF panels instead of wood, this object was totally lacquered. It was also the first object adding the lighting function to a storage small furniture item.

### *2.1.2 Groove joint, dado joint, halved joint*

These kinds of joints are made with special tools and provide special details that can lead to fine visual effects or to replace other special accessories for certain functions (Fig.7). The halved joint could also become an important conceptual element, providing the structural possibility for assembling an entire object (Fig.8).

Fig.7 – Objects using the dado joints – they confer them a sliding system without any other added accessories. The box has sliding shelves to place A4 paper on them (left) and the mirror top of the jewellery box can slide off the box when it is moved to close it (right).

Fig.8 – The helved joints of three similar wooden panels could lead to the concept of a folding chair. The joints permit assembling and resembling the chair, conferring the needed structural strength at the same time.

### *2.1.3 Complex joints – finger joint, dovetail joint*

These joints can be hard to make without the right tools and good skills. Though, they provide better structural resistance for the elements they use it (Fig.9). Finger joints have to follow some rules for fingers calculations (as their odd number). For easier production, finger joints were able to be adjusted in such a way to have less cutting work to be done (less fingers with larger dimensions along the edges could be able to confer enough strength to the object, easier production but changed the final visual effect). All adjustments implied direct influences of final forms of details for the final projects (Fig.10).

Fig.9 – A storage box for wine bottles was executed using finger joints. Their number and sizes implied much more work, but they also confer better resistance of the frame, giving the opportunity to use a very thin panel. The dado joints inside permit the raster to be modified with easy, depending on bottle's size or box's usage.

Fig.10 – The multifunctional furniture item above used a thicker panel, while finger joints were reduced to maximum. They were reducing the complexity of execution process and they conferred enough rigid and resistant structure for object's usage. This furniture can be used as storage (i.e. for reviews and magazines), as chair or as a small coffee table – all the functions depends on the position it is placed.

Dovetail was considered one of the heavier joint technologies for such studies and production stages. The dovetail joint is very strong and resistant to actions. This joint required strong reasons to be used. There was one very interesting concept of an object based on dovetail joint principle – the final design itself derived from it (Fig.11).

Fig.11 – Dovetail joint seemed to be the most difficult to be executed. Not many students approached this joint type. This concept instead was ingeniously combined just one type of element in such a way that final result became an interesting transformable object that can be used as fruits pot, pens holder, vase support or even cake plate holder as turned upside down. It's moving elements, generated by the specific wooden joint used, confer the playful liberty of usage. It can also be used just like a decoration, being very similar with a skyscrapers wooden model at one point…

## 2.2 Student's personal involvement into project's approach

### *2.2.1 Focused studies – material versus concept*

By direct collaboration with woodworking producers, students could have the opportunity to interact with different types of wood, tools, machinery and work with carpenters, learning by experiencing. High interest and increased focus, completed by personal implication and assumed responsibility, aligned to a professional context, were able to be observed for the students, comparing to their scholar regular behaviour before.

Direct discussions with carpenters were leading to many changes and trial instances of phases of projects which were leading to find out the most direct links between material, technologies and final form.

### *2.2.2 Final presentation*

Final presentation was also important as a Design step for the entire process. First of all we were trying to exploit the beauty of wood itself and get the natural character for the final objects. Therefore the requests were to avoid other surface interventions as other lacquering or graphic techniques. Keeping the quality of design and execution higher and avoiding harmful processes, we can focus more onto what wood can be, including the context of ecological products.

Final draft presentations were able to use pictures of 1:1 scale final object, as also intermediary stages of the Design and production process. This could be more comprehensive and useful as a presentation tool for the students too (Fig.12).


Fig.12 – Here are some posters of the students, presenting their Design concepts. [1] Alina Laieş presented her multifunctional furniture as in Fig.10; [2] Andreea Başag adaped shapes and sizes of a small coffeetable to an iPad; [3] Vali Radu grooved an entire audio system addapted for a smartphone or other similar devices.

We were using the products for different specific exhibitions as Bucharest International Furniture Exhibition (BIFE) and we also organized a public "IT WOOD BE" event where people could interact with products in an unconventional location (Fig.13). These were reasons for students to care more about their product's good conditions, as well as they had to find out more about marketing and visual communication tools like posters, visit cards, invitations, event behaviour, networking, public speaking and more.

Fig.13 – Snapshots from "IT WOOD BE" exhibition at Pallets. The visitors could test and interact with products and students. The collaborative and friendly atmosphere could lead to questions like "Can I buy this?" as well as to satisfaction of little visitors fascinated by lights, multifunctional and small size objects perceived almost like "toys – our learning toys".

## 3 CONCLUSIONS

Introducing this “Experiment as learning tool” it could be observed the increasing of students’ interests for more time and focus investment into their projects. Their satisfaction and self-confidence also increased.

Producers and materials / accessories providers are also very much interested to work with students and invest into future potential collaborators. They can experiment a new tool for marketing and human resources long-time investment that can improve the sustainability of the entire furniture market.

The final results can be shown to the public as well as personal results, but also as learning tool used by University, collaborating with local market players. These experiments may show to everyone interested into such developments that benefits to all parts involved can be increased.

The public feedback was also noticed as receiving many appreciations and likes, but most important was also the question raised by it: “Can we buy it? How much it cost? I would like to have this…” Unlike as in other countries where there are producers investing into students’ projects or some Universities can produce themselves some of their students’ projects, in Romania is yet unused to happen like this, but this experiment can show it could be possible to consider similar developments in the near future.

# RELATIONAL LANDSCAPE

**Cristina ENACHE**[1]

[1] *University of Architecture and Urbanism „Ion Mincu"(ROMANIA)*
*cristinaienache@yahoo.com*

**Abstract**

This paper defines a concept that responds to a general question which is characteristic to the current urban development, to the information, communication and mobility era:

*What happens between different structures of the landscape? Between the historical centre and the new urban developments? At the interstices of structural juxtapositions resulted from the new infrastructure insertions, from the development of new functional or spatial structures, from the neighbourhoods and abandoned industrial areas, to the dysfunctional suburbs?*

The concept resembles that part of the landscape that relates different spatial, functional, identity structures, that have the role of ensuring the coherence of the landscape, to ensure the continuity, fluidity and attenuation of differences, providing social cohesion.

The *Relational Landscape* is a landscape in evolution, captured as a phenomenon but also as a present state.

The proposed thematic is in line with the current trends - both of solving the urban problems that occurred following the strong increase of the cities, and the landscape issues as framework of social existence (as it is defined in the European Landscape Convention Florence, 2000).

The concept approaches, on a multidisciplinary level, the urban landscape resulted after urban development and globalization processes, seeking to solve issues related to formal - morphological, social, cultural – identity, functional and image aspects. The multidisciplinary approach - beginning with the urban / architectural sphere – involves the study of social – human, geographical – urban and technological – communicative levels, targeting a constant interaction between them.

The *Relational Landscape* as a both theoretical and practical concept struggles to solve the problems of spatial segregation, alienation and absence of the sense of belonging in the information society. This new concept includes, by definition, the idea of spatial and social communication - through coherence, connection and identity. The study is brought from the theoretical - conceptual area to the practical - applicative area, through reference to the concrete framework of the urban landscape.

The current research aims to outline a concept with practical applicability, intending to form the theoretical framework for urban strategies directed to the complex structure (social, cultural, historical, urban and architectural) of the landscape.

The range of parameters established in the study will be available to be used in the analysis of the urban dysfunctions, in the strategies of urban revitalization and of recovery of the lost identity, caused by the nowadays urban explosion.

**Keywords**: landscape, urban structure, communication, coherence, identity.

# 1 ARGUMENT. GENERAL CONTEXT.

Contemporary city landscape is a mosaic composed from urban pieces – images, architectures, spaces, communities. The dialogue between different urban fragments involves different types of relations. Indiferent juxtaposition, historical accumulation, insertion in context, contrast or continuity, segregation or rupture, the urban frame offers various situations that compose this urban landscape.

The contemporary city landscape is a mosaic made up of urban fragments – images, architectures, spaces, communities. The dialogue between different urban fragments implies different types of relationships. Juxtapositions, indifference, historical accumulations, contextual insertions, contrasts or continuities, segregations or chasms, the urban frame offers various situations that make up the landscape.

The history of cities reveals an inconstant evolution, composed of continuities and discontinuities; any urban project must take into account both the time context that the built environment offers – past and present – but also the space it is part of. Starting with the 20th centtury, the rhythm of the urbanization process and the technological developments have created new problems, due to the change in the ratio of space/ time. It is now absolutely necessary to retrieve the relation between the city and its history (taking into account the loss of urban identity) as well as to identify our expectations from the contemporary era, before making and defining new rules of urban interventions.

A result of urban expansion, the current urban / metropolitan landscape raises a series of issues. These issues are caused, among others, by neglecting the context, intensive construction, ignoring the social aspects. The loss of identity is one of the main consequences, as well the social segregation. Background of the generated issues, the landscape suffers through discontinuity and ruptures on several levels. This way, various elements appear such as areas, lines and nodes whose main feature is that **they have no feature**. Vacant lots, brutally inserted "screens", or the simple juxtaposition without an existing dialogue between the components are all elements of fracture in the landscape.

The general urban context is primarily characterized by the cultural heritage of ages past. The way in which it represents or not an identity element within the cities depends on the society that consumes and lives the space, on its capacity to appropriate the place, on the ability of space adaptability to new needs, demands, aspirations. Because the space appropriation is conditioned both by people and by the space itself. In a period in which the virtual contacts take the place of the physical ones, the social value becomes extremely important, beyond its historical extent.

The information technology revolution has led to discontinuity and change, having an impact incomparably greater than any other previous revolution.

Due to the scale that characterizes the new urban entities, the notion of landscape becomes ambiguous, complicated by the overlapping of different structures, images and various features – often of opposing typologies (urban / rural, natural / anthropogenic, etc). It is actually a succession of landscapes, characteristic to the relations between human and nature, between different ways of dwelling. The resulting landscape is characterized by multiplicity, variety, structural and spatial discontinuity. The major risk is alienation, the loss of the sense of belonging.

*"There are other spaces. Regions that can barely be deciphered, which lack clear organization in terms of natural features or man-made structures, cities without clear density and typology gradients from the center to the periphery, interim spaces, settlements archipelagos, political spatial constructs without a clear identity. Their text must be laborious decoded before it becomes legible."*[1]

The Relational Landscape represents a concept proposed for the transition areas between different structures in the urban landscape – inside the city or in the interface area of the city and the natural environment. The concept refers to solutions for solving the urban fragmentation, regardless of the level/s affected, aiming achieve continuity and coherence in the given space.

# 2 RESEARCH OBJECTIVES. METHODOLOGY. RESEARCH QUESTIONS

The subject of this research starts from one of the main issues of urban sprawl and globalization – the loss of local / regional identity. The landscape, as a local generator of identity – in terms of traditions or branding - can provide, through the continuity of the context (spatial, social and cultural), iconics stances that can become memorable through the the path readability, the psyhical comfort and the sense of belonging through recognizability.

The objectives of the future research aim to outline a continuous study structure in order to define the newly proposed concept of "relational landscape":

- Definining the "relational landscape concept"
- Identifying the characteristics. Relational landscape typologies
- Outlining the general and / or particular situations
- Morphology items. Interdisciplinarity

The study methodology gradually builds the proposed issue. Thus, the necessity of the concept is argued in the current context of urban expansion, that overlaps and juxtaposes different spatial and morphological structures, describing various urban, social and architectural configurations. The existence or non-existence of relations determines different attitudes, perceptions, approaches and assimilations of the urban / suburban space. The issue of acceptance, awareness, recognition of the space where the man lives (dwells, relaxes, walks, works, etc) is a consequence of the way in which the landscape structures – juxtaposed or simply adjacent or annexed – communicate or not.

The study initiated by this research wants to answer several questions that follow some key issues:

- Outlining the "rupture" or "segregation" situations in the metropolitan landscape or in the interaction areas between urban / urban, urban / peripheral, urban / rural or urban / natural
- Identifying the causes that have determined the spatial discontinuities
- Identifying solutions through the urban development projects that have been already implemented and overlapping with the situations previously formulated

So, the starting questions of this study could be:

- What kind of factors have determined the discontinuities in the urban / metropolitan landscape?
- What are the discontinuity types that can be identified?
- What are the levels affected on each type of landscape discontinuity?
- What kind of relations should be restored / built for "linking" the landscape?
- What / how many types of "interfaces" to connect the fabrics can be identified / built to "link" the landscapes?
- Can an "algorithm" be imagined to restore / to design the link between segregated spaces – to design the "relational landscape"? (depending on the factors that have caused the segregation, on the type of discontinuity, on the affected levels, on the necessary relations)

## 3 URBAN LANDSCAPE – OVERLAPS, DISCONTINUITIES, RUPTURES. TYPES OF RELATIONS / CONNECTIONS

The contemporary city offers, on the path level, successions of images corresponding to the forming layers of the urban organism. If the city centre often shows organic additions, the later developments arise rather as insertions than urban landscape continuity areas.

The urban landscapes consist of two different morphological bases – the city and the urbanization - and this is an essential issue in optimally approaching their nature**.**

Nowadays, the urban image is a succession of urban agglomerations, structured as a hierarchy of spaces organized based on the same typology. In an horizontal section of urban fabric we can identify, on a general level, the following succession of sequences:

- The historical core of the city
- The ring of pre-war neighborhood (grand boulevards, plazas, urban squares)
- The ring of inter-war period developments
- Post-war residential suburbs
- Old industrial areas – „swallowed" by the recent urban expansion – abandoned areas, non-functional or converted in other functions (urban industrial heritage)
- New urban developments
- The urban periphery – functional mixity – individual housing, logistic and industrial areas, commercial platforms, etc.
- City belt area
- The peri-urban ring – rural (rurban) areas, natural zones (forests, mountains, lakes or rivers, etc), agricultural areas.

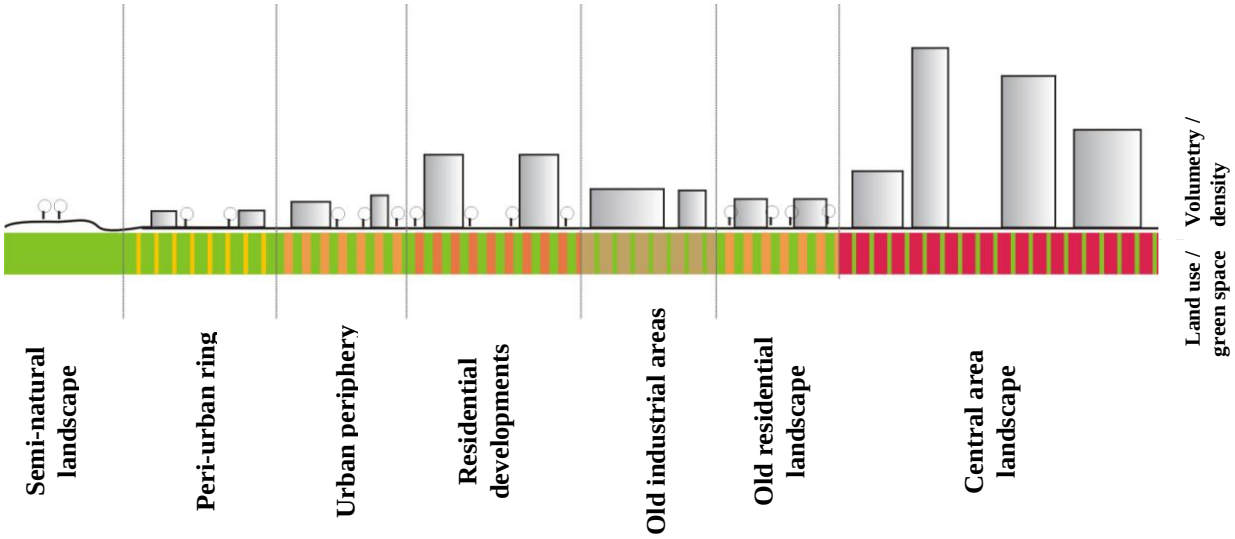


*Image 1 - Schematic section of urban landscapes sequence, author – Cristina Enache [2]*

The technological revolutions, including the Information and Technology Revolution, have determined, on the urban level, changes in the:

- Urban functional structure
- Mobility structure
- Structure of significance

After analyzing the types of urban tissue and the possible contexts, the following situation results on the urban level:

- juxtaposition of elements from different historical periods, without organic structure and contextualism
- functional incompatibility
- urban tissue rupture
- social / functional / spatial segregation
- independent urban development
- juxtaposition of different landscape typologies (eg. – industrial / natural, etc)

Depending on the defined situations, the ways of connection result.

*A positive example can be identified in the development of La Defense district in Paris – continuing the main axis of the city – spatial and historical identity – and marking through a simbolical similarity – the Arch. The continuity was thus followed on both a spatial and a functional level, but also at urban flows level and especially on an identitary and symbolic level.*


*Image.2 - Louvre – La Defense Axis in Paris – satelite image and urban perspective - foto: Cristina Enache*

The relational landscape is identified both in specific situations (provided in the design process), but also in situations which need to be studied (on the urban dysfunctional levels).

## 4 CONTINUOUS RESEARCH. PRACTICAL APPLICABILITY.

The present paper represents the starting phase of the proposed study – which corresponds to the argumentation of the approach necessity of this particulary aspect of urban landscape – of linking different structures – urban, spatial, social or architectural. Characterized by fragility, these landscapes act as "articulations", urban "hinges" between the mosaic fragments which make up the contemporary city.

The study will be continued through several stages which will follow mainly the theoretical approach, but also the practical applicability, on the urban strategy and local design level.

On an educational level, the concept was experimented through several thematic projects organized in the Landscape Design and Planning section, aiming towards the landscaping intervention in different urban forms.

So, different urban areas characterized by tissue's diversity, spatial discontinuity and the presence of interstitial areas in the fracture zones were proposed for studying. The theme of the project requires from the students to imagine a unitary vision for the studied site, following an intervention in the green urban system. The projects aim to build continuity on the urban fabric level, but also to find a specific solution for each case.

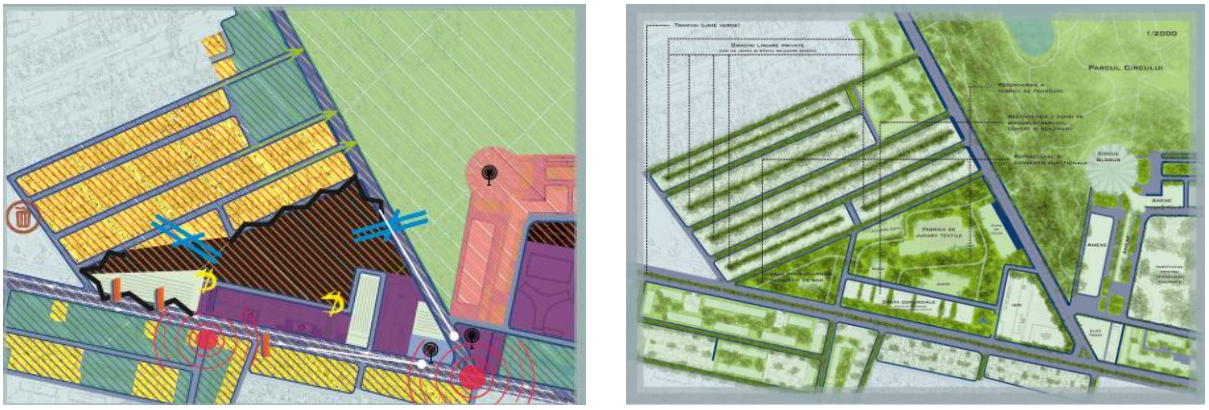


*Image.3 - Student project – Synthesis of analysis of the study area. Intervention at the green system level - authors: students Diana Catană, Alexandra Țăranu, project tutor –Cristina Enache*

## 5 CONCLUSIONS

The cities are faced with a situation of re-composing their heterogeneous fragments in a vision of urban continuity. The French architect Bernard Huet says that "*the real function of the urban project is to produce temporalities, continuity, regularity, to determine the form of public spaces and to provide a context for the architecture....The city needs rules*" [3] The art of building cities – which is situated at the interaction between society and its territory – serves to ensure a continous process of development whilst keeping a balance between present and future. How can we recover the urban identity and how can this identity become a part of a contemporary perspective? [4]

*Image.4 - Segragated urban landscape- Bucharest, foto: Cristina Enache*

The idea is that the contemporary city would be no longer fragmented. It could become a mosaic city, a mosaic entity, whose fragments – witnesses of the sense of places that they generate – would be coherently interlinked,

through sequences corelated on the path level. Such an urban strategy is necessary in order to identify the components through which the fragments can be corelated.

In this context the new proposed concept finds its place – the *Relational Landscape* – as a link (= continuity), relation (=dialogue), connection (the connection of two areas through the third), transition (gradual passing) between different structures of landscape – whether they differ because of the historical period, of the function, morphology, social component, etc.

The Relational Landscape can be defined as

> *The particular structure of urban landscape which connects urban areas – different at historical, morphological, functional, social levels – by building a visually or significant – symbolic continuity, as a result of the characteristics of the areas in which the relational landscape occurs.*

If the industrial period has promoted the lifestyle divided into completly separated zoned sections, the contemporary city proposes an accumulation of spaces with cultural diversity. The experience of going through the urban spaces becomes similar with browsing in cyberspace. In the informational age, the urban design has to be guided by the decentralized approach of the Internet, building urban unities from items that vary in style or function, being connected through linking elements.

The consequences arising from these changes occur in the new Urban Landscape, whose features prove to be the diversity and coherence - both perceptible - of the urban image and also of the use of space. The landscape is perceived in movement, dynamic; spatial linking of urban nodes becomes essential to ensure spatial, functional, aestethic and contextual continuity.

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# IS CONTEMPORARY ARCHITECTURE A PRODUCT OF GLOBALIZATION?

**Ioana CORBU**[1]

[1]*Architect (ROMANIA)*

*"Architecture is the will of an epoch translated into space"*[1]

*Mies van der Rohe*

This paper represents part of the research in the context of my PhD. thesis. Considering the restraints and possibilities of the globalized world in which we are now living, being an architect seems to be a struggle in redefining our profession. My intention is to show that the conditions in which architecture has evolved have always been, more or less, the same over time, only now we are dealing with a turnover of values. And, since the moments of turmoil are good moments for study and reflecting, my purpose is to determine which are the premises of architecture redefining itself in the near future.

Although defined as a term in 1983 by Professor Theodore Levitt[2], the word "globalization" has its roots hundreds of years ago. Actually, the first mention of the adjective "global" dates back in 1892 and the first definition of it appeared in Webster Dictionary in 1961, as a derivative of the French word *"mondialisation"*. In 2004, the definition of globalization as stated by the National Intelligence Council from the United States of America reads like this:

*"Globalization denotes the growing interconnectedness reflected in the extended flows of information, technology, capital, goods, services and people throughout the world."* [3]

Globalization is a historical process, shaped ever since the time of the first silk routes of Eurasia and Genghis Khan's pursue of a world empire (1165 – 1227), its inception being deeply rooted in the adventures of the great geographical discoveries, starting with 10th Century China and the 12-14th Century Italian Maritime Republics. In the booked called *"Pioneers of Globalization"*, Jorge Nascimento Rodrigues and Tessaleno Devezas[4] write about "*the three basic waves"* which contributed at the development of economic globalization:

- **The first wave**: the consequences of the transoceanic travels initiated by the Portuguese in the 15th Century (the international commerce involves four continents already);

- **The second wave**: the opening of the Suez Canal in 1869 and establishing a new route towards India;

- **The third wave**: the economic reforms introduced by the Chinese president Deng Xiaoping which reopened the boarders of China to the world in 1978, the fall of the Berlin Wall in 1989 and the "implosion" of the Soviet Union.

[1] http://www.nytimes.com/learning/general/onthisday/bday/0327.html
[2] American economist and professor at Harvard Business School (1925 – 2006)
[3] http://www.futurebrief.com/project2020.pdf - Report of the National Intelligence Council's 2020 Project Based on Consultations with Nongovernmental Experts around the World, **Mapping the Global Future**, December 2004
[4] NASCIMENTO RODRIGUES, Jorge and DEVESAZ, Tessaleno, **Pioneers of Globalization – Why the Portuguese Surprised the World**, Centro Atlantico, Portugal, 2007.

Neither the term "multinational" company is something new. In the year 1600 it seems that almost 500 such companies existed, their number doubled a hundred years later, in 1700. Before the First World War began, around 3.000 multinationals were known, 30.000 in 1990 and over 64.000 nowadays.

In the 15th Century, during the great geographical discoveries led by the Portuguese, a new city model is established, the overseas cities with a European profile, highly connected to the global European cities of the moment, like Lisbon, Seville, Antwerp. [5]

And so, cities like Accra, Goa and Macau became more than just colonized territories, a pattern of administrative structure and political, social, economic, cultural development is being imprinted on them, according to the ones used in their conquerors' native countries. What started out of curiosity and profit strategy, the adventure of the Great Discoveries, has consequences even in today's world: Brazil, India and China are the main emerging economic powers of the world, with an architecture of the cities that reflects the history of the first cultural transfers.

While The United States of America stagnates and Asia is on the rise, Europe is in decline after the recent world economic crisis. In Europe there can be observed a series of issues like: decreasing competitiveness, slowing dynamics, aging of the population, lower research volume, the migration of the creative people and the relocation of industries in Asia without being replaced by new ones.

Regarding the architectural profession, many American and mostly European architects are moving towards Asia or Africa and this is a moment when we can observe how different cultures interact or even collide. It is a moment when architecture's importance to delivering political agendas and shaping social change is on the spot light. It is a point when we can highlight the experiment. The successful experiments are taken over, assumed and adopted worldwide. The architect is no longer the ambassador of a specific culture and of his native society; he becomes himself a way of transmitting information and innovation. The most important characteristics of globalization which have also shaped the architectural profession in today's world are: massive movements of people, information, capital and products.

In the context of a world defined by mobility and continuous changes, what is the current role of the architect (especially if we consider that "architecture" contained also the term "stability")? Architectural objects have always had to pass the test of time. It is not only whether they still stand over the years, but if they are still desirable, if they still fit in the urban scenery and if they still respond to society's needs. Although it is a lot of debating over "sustainability", lately a keyword in most discussions over architecture is "resilience". The duration of a building's life has shortened considerably, sometimes because of the technology, but mostly because of the rapid transformations in all fields, economic demands, the permanent desire of something else. For now, the rules of consumerism prevail in urban planning as well as in architecture. Is contemporary architecture the result of quick decisions? What about planning? Time used to be a very important part of the design process. Now, time is what we lack. Because of the quick succession of time lapses we are now witnessing, this process has compressed and is accelerated beyond (sometimes) comprehension, damaging the results. Rem Koolhaas said in an interview that the architect's profession *"has been reduced to playing eternal catch-up with corporatized aspirations and trend data".* [6]

## FROM THE GREAT GEOGRAPHIC DISCOVERIES TO CONTEMPORARY ARCHITECTURE

The historical evolution of humanity has always relied on the principle of innovation, which came to complete, to change and to renew a series of customs, models and values that had already been grounded into tradition. In fact, Experiment can deliver Progress. The history of the humankind is the history of the successful experiments and the history of architectural experiments is intimately connected to social, economic, political,

[5] NASCIMENTO RODRIGUES, Jorge and DEVESAZ, Tessaleno, **Pioneers of Globalization – Why the Portuguese Surprised the World**, Centro Atlantico, Portugal, 2007, page 151.

[6] http://www.independent.co.uk/arts-entertainment/architecture/russias-aesthetic-revolution-how-soviet-building-still-influences-todays-architects-2373447.html

technical and technological experiments. This is why the *"restrictive filters"* of globalization are culture, political administration, political disruption, technology and economy. [7]

But innovation also implies failure. When experimenting, one takes risks, and most risks result in failure. Centuries ago, even decades ago, one successful experiment brought welfare to generations. Economists argued that it took 4 generations to wear out the benefits of a successful experiment. Kondratieff calculated 2.5 waves of expansion and depression, lasting about 50 years. Nowadays, failure can occur even in a person's active years; thus, the need of adaptation. Nowadays curiosity reaches for well-established models. Some architects choose to practice what they know that has worked somewhere else, some adapt or improve, through research. There has been a lot of debating on this subject, some call it "creative copying" and see the benefits of copy-cats. But in most cases, copying well known models of buildings has nothing to do with being creative, on the contrary.

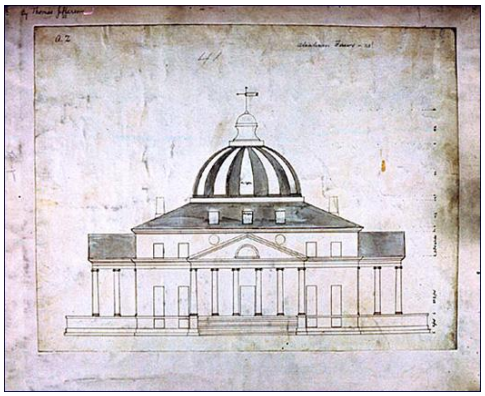
At this point, it's important to talk about "where?" and "for whom?".

Taking a closer look in the history of civilizations, we can easily identify a lot of similarities between public spaces or buildings, from different parts of the world, different periods of time, without calling them copy-cats. They were a result of different kind of influences (political, cultural, religious, economic), sometimes they were models specifically chosen to serve a certain purpose. How an architectural object or space looked like was not the most important feature, but what it stood for.

One of the most obvious examples is Palladio's influence on American architecture. It served as a model for the culture of the newborn civilization, but his buildings were never only copied. Thomas Jefferson, the most important promoter of Palladio's concepts didn't even see his buildings, although he could have when travelling to Italy in 1787, at a time when his was the United States of America's ambassador to France. Palladio's book *"I Quattro Libri di Architecttura"* inspired many architects over the centuries, but we cannot say that it served as a manual for the way American society designed its buildings, just like we cannot say that the United States Capitol in Washington is a copy of Saint Peter's Cathedral in Rome. However, *"nineteenth and twentieth-century architects in the United States, in the absence of an indigenous architectural language for civic and state power, paradoxically felt impelled to adopt the symbols of monarchy, aristocracy and papacy realized by the two Renaissance architects"* [8] (Michelangelo and Palladio).

Saint Peter's Cathedral – Rome

US Capitol - Washington



Palladio's Rotonda - Vicenza

Thomas Jefferson's entry project for the White House Competition

[7] NASCIMENTO RODRIGUES, Jorge and DEVESAZ, Tessaleno, **Pioneers of Globalization – Why the Portuguese Surprised the World**, Centro Atlantico, Portugal, 2007, page 151.
[8] HIND, Charles and MURRAY, Irena, **Palladio and His Legacy – A Transatlantic Journey**, RIBA, Marsilio Editori, Venice, 2010, pg.7.

*"Compared to other man-made objects, architecture is probably closer to politics. Think to whom a building belongs, the aesthetics and culture it reflects."* [9] - Ai Weiwei

Politicians also got personally involved in the current debates over the expression of contemporary architecture. In 2013, Hilary Clinton addressed to the Council of Foreign Relations her final speech as U.S. Secretary of State. She then said that: *"We need a new architecture for this new world, more Frank Gehry than formal Greek. Some of his work at first might appear haphazard, but in fact, it's highly intentional and sophisticated. Where once a few strong columns could hold up the weight of the world, today we need a dynamic mix of materials and structures."* [10] referring to the future of diplomacy in the 21st Century. But one of the most surprising speeches was the one that the Chinese President, Xi Jinping, held at a literary symposium in Beijing recently[11]. He asked for *"no more weird architecture, please"* and stated that art should *"be like sunshine from the blue sky and the breeze in spring that will inspire minds, warm hearts, cultivate taste and clean up undesirable work styles".*

Meanwhile, a lot of *starchitects* also speak about contemporary architecture in terms that are anything but appreciative. Frank Gehry says that modern architecture deals with *"cheap copies of buildings that have already been built somewhere else"*, *"anonymous skyscrapers"* and calls for *"architecture that responds to the place and culture"*. [12] Daniel Libeskind emphasizes on the importance of *"involving the citizens in urban planning"* [13], while David Chipperfield's opinion is that *"Politicians are only interested in architecture if it's related to regeneration"*, but *"architects must accept some responsibility for the public debate on architecture, because they have designed so many bad buildings".*[14]

A manifesto for the 21st century city would imply interaction between city, architecture and inhabitants. Because of the vertiginous speed of changing things, the balance between traditionalism and modernity (understood as synonym of the experiment) is becoming more and more fragile. Unfortunately, the globalization phenomenon is either associated with lack of personality or with a very strong identity, regardless of the environment where placed. Because of the buildings' rise speed and fast growing urbanization, the attributes of the contemporary architecture have become effectiveness and universality. We see a lot of misunderstood principles, we see marketing overruling architecture, culture, tradition, we see countries trying to reinvent themselves according to what others may find attractive, we see populations which became rich in a very short time wanting to show off or to have it all at once, cities rebranding themselves by erasing traces of tradition, of personality and we see individuals rather than societies.

Architectural value does not consist only in an object's economic or aesthetic value, it implies VISION. Architecture is a product that educates, inspires, shapes and reflects the contemporary society of the built architectural object.

In a conference delivered in 2014, at the UIA Congress in Durban, South Africa, Wang Shu talked about *"a way of architecture that assembles abundant differences"*. And it was the perfect context in which he stated his vision. Not only in China, but all around the globe, urban areas are dealing with exponential growth. We are now talking about mega-regions, half of the world's population living in cities already and expecting that by 2050 over 75% of the population to live in urban areas. The largest 40 mega-regions are lived by 18% of the world's population, but gather over 65% of the world's economic activity and over 85% of the world's technological and scientific innovations. Economically speaking, the wealth is now defined by mega-regions rather than by geographical boarders between countries and also the notion of "city" is becoming more important than the notion of "country". Let's take for example the largest mega-region of Europe - it is spread over several countries and it includes the following cities / economic centers: Amsterdam - Rotterdam, Ruhr - Koln, Bruxelles - Anvers and Lille. It has over 59 million people and, economically speaking, it surpasses Canada or China. So we have parts of The Netherlands, Germany, Belgium and France highly interconnected by infrastructure, production, money, jobs etc. while all of them have a remarkable identity with a high degree of representation through history, culture and traditions. How does this partnership work? A new culture is being created? Given this scenario, architects must think about ways to *"respond to alterations in the nature of public*

[9] KLEIN, Caroline, **Ai Weiwei: Architecture**, Daab Media, Cologne, Germant, 2011
[10] http://talkcontract.contractdesign.com/2013/02/hillary-clinton-uses-gehrys-architecture-as-analogy-for-modern-diplomacy.html
[11] http://shanghaiist.com/2014/10/18/eliminate_all_weird_architecture_in.php
[12] PAUKER, Benjamin, **Epiphanies from Frank Gehry**, "Foreign Policy", July/August 2012, www.foreignpolicy.com/articles/2013/06/24/
[13] http://www.bdonline.co.uk/news/libeskind-calls-for-greater-public-involvement-in-architecture/5043095.article
[14] http://www.bdonline.co.uk/david-chipperfield-lambasts-politicians-for-lack-of-interest-in-architecture/5043121.article

*space, housing, mobility, spatial justice, environmental conditions, and other major issues in near-future urban contexts."*[15]

When everything is changing so rapidly, what is the architect's advantage? What is his duty?

*"The timeless task of architecture is to create embodied existential metaphors that concretize and structure man's being in the world. Images of architecture reflect and externalize ideas and images of life; architecture materializes our images of ideal life. Buildings and towns enable us to structure, understand, and remember the shapeless flow of reality and, ultimately, to recognize and remember who we are. Architecture enables us to place ourselves in the continuum of culture."*[16]

It's no news that good quality architecture has always been the result of merging ingredients like: *team work* (architect, client), *money*, *site*, *theme*, *context* (political, social, economic etc). With all these fortunately combined, we may expect for an architectural object to become reference. How difficult is in nowadays globalized world to make this possible? We are now talking about foreign architects, foreign clients, foreign capital flow, foreign society, foreign culture. Can we possibly think of an equation where all the ingredients are planned before so that we can ensure that the result would be good quality architecture?

In order to consider this, we must appreciate what good quality architecture really is. If we define it as the ideal merge of all the above mentioned conditions, we might find the architects' role being shadowed by the work of intermediaries, such as project managers, accountants, clients who no longer are just one person, but rather several company managers, financiers, consultants, researchers and so on. Being a skillful architect is not enough in the globalized world in which we are living. The architect must be a good businessman, must advertise his works, must be well connected to people working in different fields of activity, should be popular and should be related to economics.

The connection between the architect and his project is no longer direct and this affects another very important characteristic of the profession: being able to educate its public. Without this, how can we keep thinking of a legacy? Is architecture becoming a process based on random circumstances?

Contemporary architecture is the product of worldwide globalization in western countries, that expand in the richest emerging countries, as genuine works or as copies translated in totalitarian view (for example the Emirates, Kazakhstan, North Korea and so on). While in the western countries, the result is an evolutionary process, integrated to the politics and economic and technological growth, in other countries becomes a quantity evaluation as resembles the original.

Values like education, civilization, tradition, culture cannot be supported only by economic growth. Capital flows must be integrated in a well-built system of values. Furthermore, when a society gets rich in a very short period of time, cultural limitations become extremely visible. Development must be sustainable in order to improve and reach new levels of valuable progress. No matter how much money one has, it cannot update civilization, history, education, if you don't have the people to understand and receive it. Architecture can be an instrument that enables a healthy evolution of a society.

*"I think the issue of tradition, understood in a very subtle and broad way, as something that is to be revealed in the present, is of crucial importance. For a work of architecture to be resistant, (...), the understanding of tradition is essential in order to produce a work that has sufficient levels of culture embodied into its form. This kind of synthesis has a quintessentially resistant character."*[17] - Kenneth Frampton

[15] http://www.archdaily.com/567449/six-teams-studying-uneven-growth-to-exhibit-proposals-for-expanding-megacities-at-moma

[16] HOLL, Steven, PALLASMAA, Juhani, PEREZ-GOMEZ, Alberto, **Questions of Perception – Phenomenology of Architecture**, "An Architecture of the Seven Senses" Essay – Juhani Pallasmaa, William Stout Publishers, San Francisco, 2007, page 38.

[17] Kenneth Frampton in an interview that him and Juahni Pallasmaa gave for Arkitektur N Magazine, December 2011, http://www.architecturenorway.no/stories/people-stories/framptonpallasmaa-11/

# INNOVATIVE ARCHITECTURAL DESIGN. CULTURAL CENTER "PANĂ FILIPESCU MANSION"

**Luca Matei Stoian**

*"Ion Mincu" University of Architecture and Urbanism (ROMANIA)*
*stoianmatei@yahoo.com*

## Abstract

The project site is located in the "historic site" Pană Filipescu Manson, Filipeștii de Târg, has a high value for Prahova County. It is part of the old historical Romanian border, a sensitive place. A border that symbolizes a limit, cut, scar, discontinuity, but it is also the place where people, culture and differences meet. The research of an identity based on this concept might give a deeper meaning to the future of the area.

The main goal was to realize a permeable space, a place for gatherings, communication, and exchange. Thinking in terms of human scale, the design of the building remains inside the site's borders and reflects its purpose of sustainability, innovation and inclusion. It all became clear considering the limit as a modular space between the two areas (the historic monument on one part and the nature on another) and as a transformation into a place for conceptual debate.

Beyond the symbolic and historic values, it seems correct, for the community, to create an outdoor space for art and culture. A place where socialization is encouraged.

The preliminary analysis and the 3D simulations suggest a horizontal solution for the project, which generates a green architecture inserted in the site. The project aims to investigate and integrate innovative architectural design solutions.The functions, which do not need to be naturally illuminated in this case, have been placed underground in order to minimize the external volumes. Now, dimensions, spaces, pathways, all have been projected following man's scale, that creates a trail link between the mansion and lake, in the attempt of recalling the human spatial experience inside an ancient historic site.

The concept design started from the gesture of both hands closing together slightly shifted, creating a space between them, becoming a visual connection between the monument area with its park, high above on the plateau and the lake area located in the valley. Due to this discontinuity you can reach another dimension, a mental one, an art place symbolically linked to the historic site, which offers a well-defined space.

Through art the project evokes history and tradition, not through vernacular processes or oriental settings, it is a exhaustive research of deep meaning with fine allusions. Critical elements both in terms of environment, urban-space, volume and function, are transformed by various innovations in a cultural center. By following two strategies in this case, one is a modular case, a neutral frame to fill with exhibitions, shows, concerts spaces. Another way is to consider the building as part of the artistic values that occur inside, giving the poetic, expressive, communicative and evocative features. The case choosen is reflected in the content.

Configuring the whole area as a successful urban intervention, around old "pană filipescu mansion" museum, and transforming the landscape into diverse numerous activities like: a area of communication and cultural dialogue, conferences, exhibitions, multi-purpose hall, restaurant, cafe-tearoom-cookie shop and also as an accommodation and recreation area around the lake was the main challenge of this project.

Prevailing itself from the idea that in the area's history, during the times of changing, rural transformation is going through architecture and for its symbolic features, it has a predominant role in construction. a good example is the amphitheater area, with its created ramp at the surface, generated by deep scars, which meant changing from being a division sign to evolving into a strong communication element, the access to the building.

Although the historic site was affected by extra-urban interventions carried out in time, the new technological procedures used in this case, like sustainable materials, energy efficiency through correct building orientatin bring out the importance of regarding every space's future.

For its innovative architectural design and exceptional interaction between different elements and aspects both in terms of designing buildings and social response, the cultural center "pană filipescu mansion" has been nominated a the "eco-architecture" 2012 annual architecture of bucharest thus underlining its perfect accordance with urban and cultural context.

**Keywords**: architecture, design, innovation, technology, environment, intervention, context, space, attitude.

## INTRODUCTION

The project site is located in the “historic site” Pană Filipescu Manson, Filipeștii de Târg. The cultural centre has its borders within a park on the shores of Lake Pana Filipescu and adjacent to historic Pana Filipescu Mansion , which has been the iconic home of the Cantacuzino and Filipescu Family, making this intervention a high value for Prahova district.

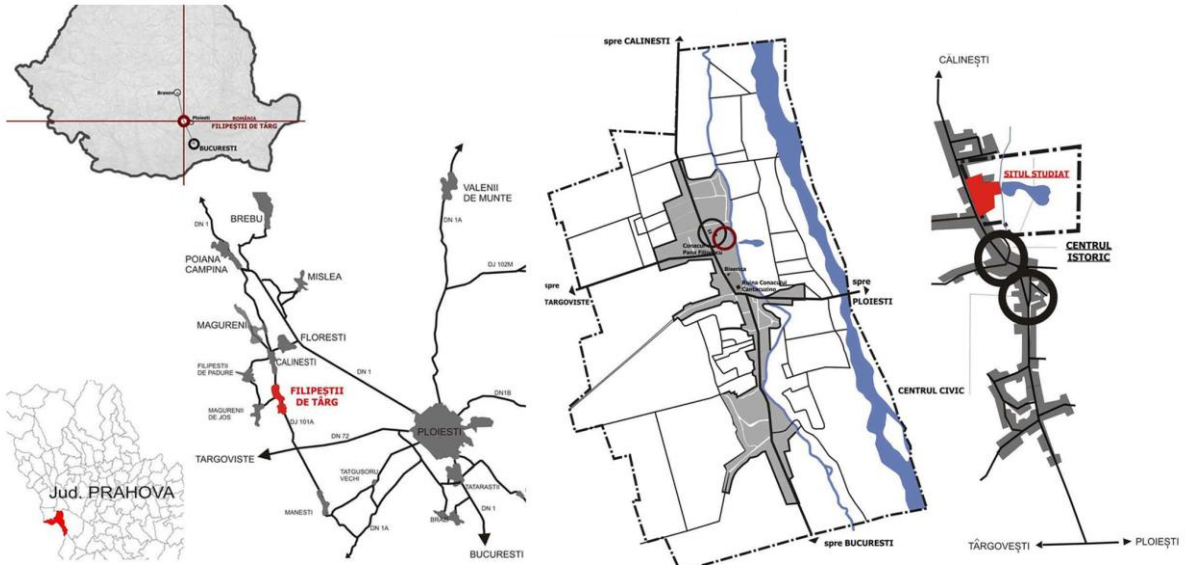



Fig.1 Localization of the project site

It is part of the old historical Romanian border, being known as a sensitive place. A border that symbolizes a limit, cut, scar, discontinuity, but it is also the place where people, culture and differences meet. As a result, the research of an identity based on this concept might give a deeper meaning to the future of the area.

Fig.2 General outdoor perspective of historic “Pană Filipescu Mansion”

## METHODOLOGY- IMPORTANT GUIDELINES

The main goal was to realize a permeable space, a place for gatherings, communication, and exchange. Thinking in terms of human scale, the design of the building remains inside the site's borders and reflects its purpose of sustainability, innovation and inclusion. It is intended to respect both the Pana Filipescu's legacy and park setting and make as soft a transition as possible from park to building.

It all became clear considering the limit as a modular space between the two areas (the historic monument on one part and the nature on another) and as a transformation into a place for conceptual debate. Beyond the symbolic and historic values, it seems correct, for the community, to create an outdoor space for art and culture.

The preliminary analysis and the 3D simulations suggest a horizontal solution for the project, which generates a green architecture inserted in the site. The project aims to investigate and integrate innovative architectural design solutions following a series of important guidelines, such as:

1. the installations used should be highly energy efficient, like: geothermal systems for climate control;
2. the proper use of renewable energy sources, like: a building-integrated photovoltaic system connected to a 60 kw network;
3. creating a very flexible and varied number of spaces, that should be able to accommodate all types of social interactions, exhibitions, concerts spaces;
4. the geometry of the building roofs should be solar panels friendly, so that this energy collecting system ca be integrated properly;

## RESULTS

The functions, which do not need to be naturally illuminated in this case, have been placed underground in order to minimize the external volumes, thus bluring the boundaries between indoor/outdoor, roof/earth, figure/ground, building/landscape. Now, dimensions, spaces, pathways, all have been projected following man's scale, that creates a trail link between the mansion and lake, in the attempt of recalling the human spatial experience inside an ancient historic site. The final resulting architecture is well hidden in the landscape, well preserved, it is a fusion of built structure and land form.

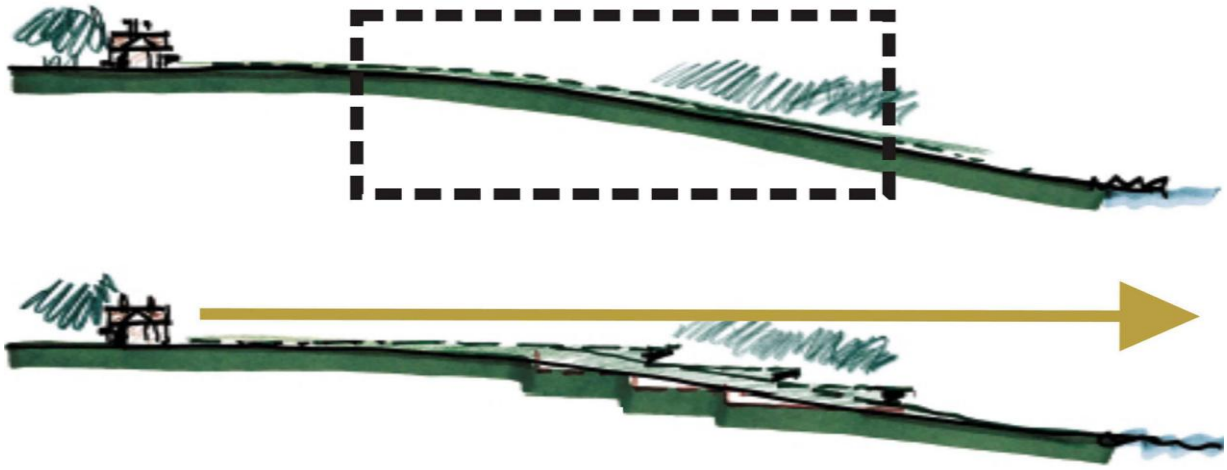


Fig.3 The concept design

The concept design started from the gesture of both hands closing together slightly shifted, creating a space between them, becoming a visual connection between the monument area with its park, high above on the plateau and the lake area located in the valley. Due to this discontinuity you can reach another dimension, a mental one, an art place symbolically linked to the historic site, which offers a well-defined space.

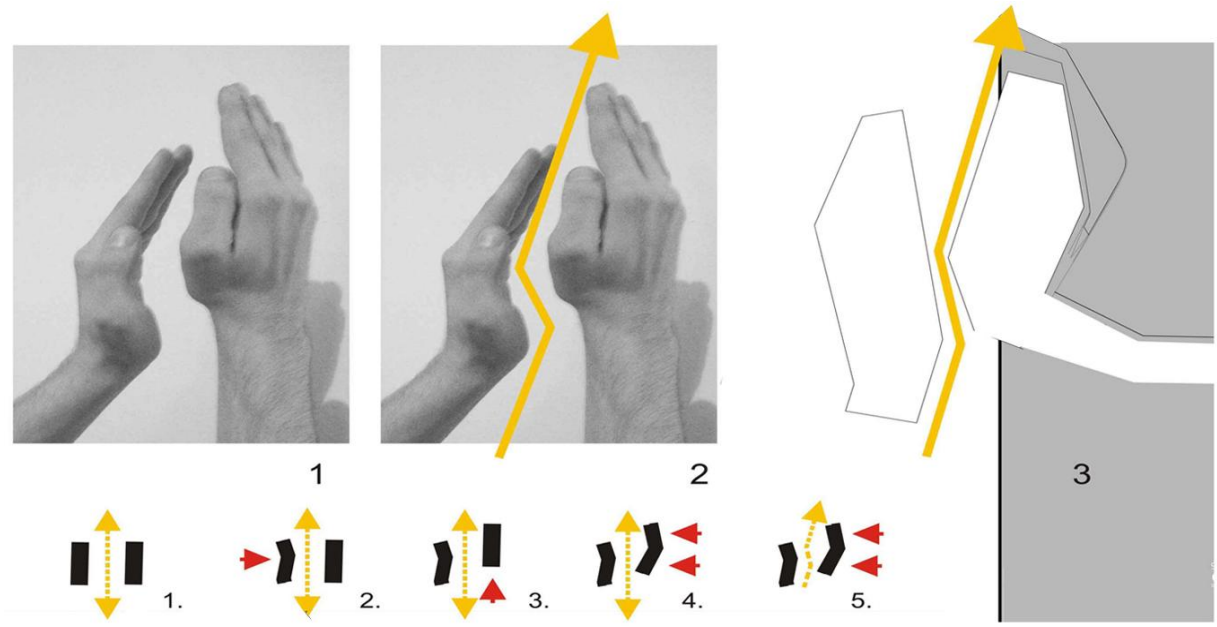



Fig.4 The concept design

Through art the project evokes history and tradition, not through vernacular processes or oriental settings, it is a exhaustive research of deep meaning with fine allusions. critical elements both in terms of environment, urban-space, volume and function, are transformed by various innovations in a cultural center. by following two strategies in this case, one is a modular case, a neutral frame to fill with exhibitions, shows, concerts spaces. another way is to consider the building as part of the artistic values that occur inside, giving the poetic, expressive, communicative and evocative features. the case choosen is reflected in the content.

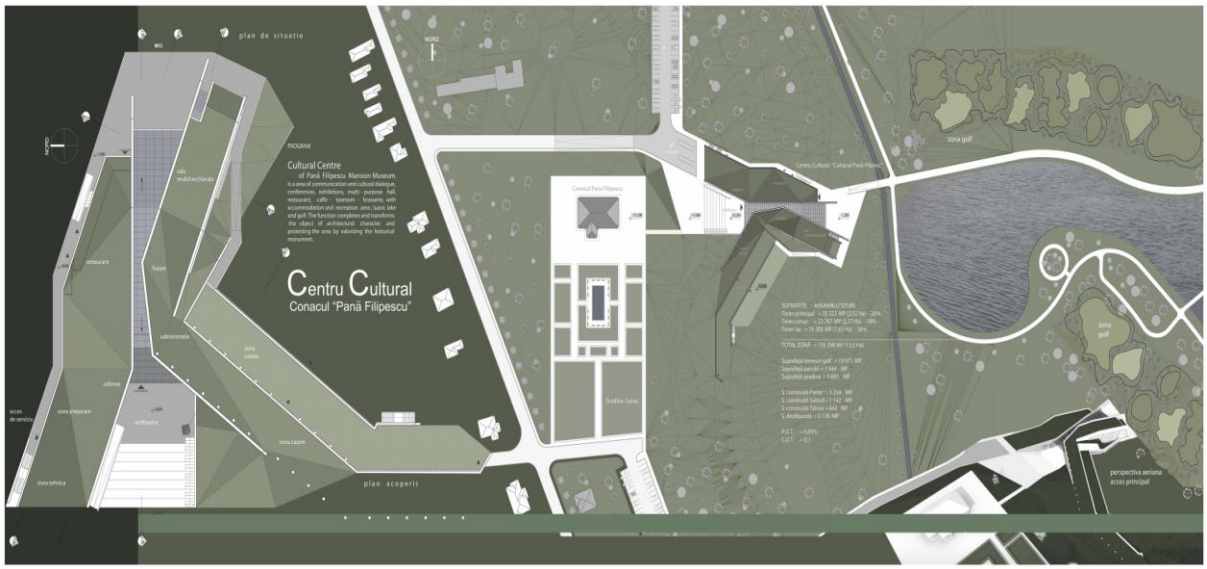



Fig.5 Site plan sheet of Cultural Center "Pană Filipescu Mansion"

Configuring the whole area as a successful urban intervention, around old "Pană Filipescu Mansion" Museum, and transforming the landscape into diverse numerous activities like: a area of communication and cultural dialogue, conferences, exhibitions, multi-purpose hall, restaurant, cafe-tearoom-cookie shop and also as an accommodation and recreation area around the lake was the main challenge of this project.

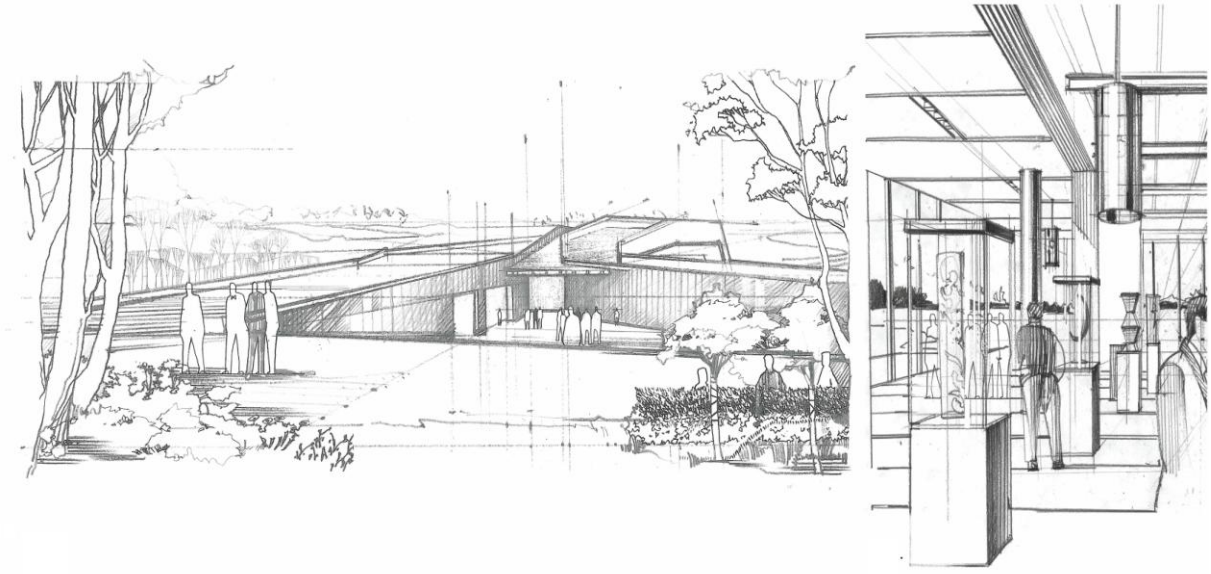


Fig.6 Hand drawn general perspective and interior design of Cultural Center "Pană Filipescu Mansion"

Prevailing itself from the idea that in the area's history, during the times of changing, rural transformation is going through architecture and for its symbolic features, it has a predominant role in construction. A good example is the amphitheater area, with its created ramp at the surface, generated by deep scars, which meant changing from being a division sign to evolving into a strong communication element, the access to the building.

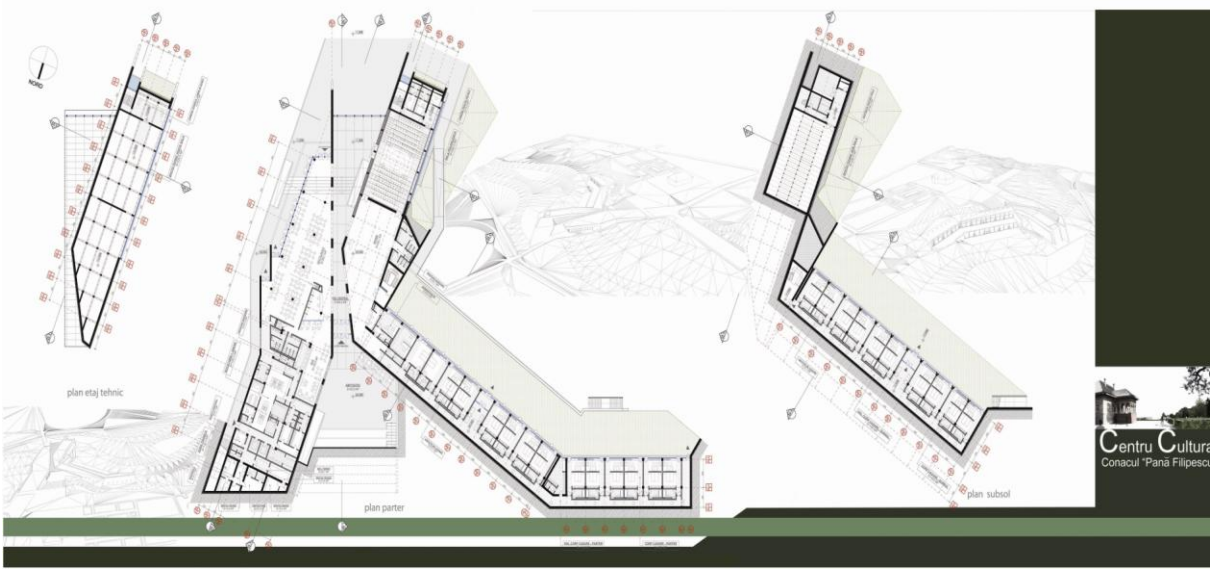



Fig.7 Ground floor plans sheet of Cultural Center "Pană Filipescu Mansion"

Another example, in this case of strong human interaction is the auditorium. It was designed as one space with a thousand possibilities to adapt to humans needs. The multipurpose auditorium was thought as the center of the Cultural Center "Pană Filipescu Mansion". It can host around 200 people, a modular machine conceived, trough a mechanical platform system, to allow different configurations, like: "flat space", "italian theatre" "round shape theatre". The pneumatic pistons reconfigure the stalls rising the platforms with the seats from diferent levels there is a acting space made of the stage. In this space the movie theatre has been designed following the projection of the ramps. What could seem pureformalism actually corresponds to the need of having a wide screen despite the small dimensions. High visibility is guaranteed by the sits arranged on grades. The stage, in this way, is reconfigured by the pneumatic pistons in grades, so in this arrangement the scene gains a central position.

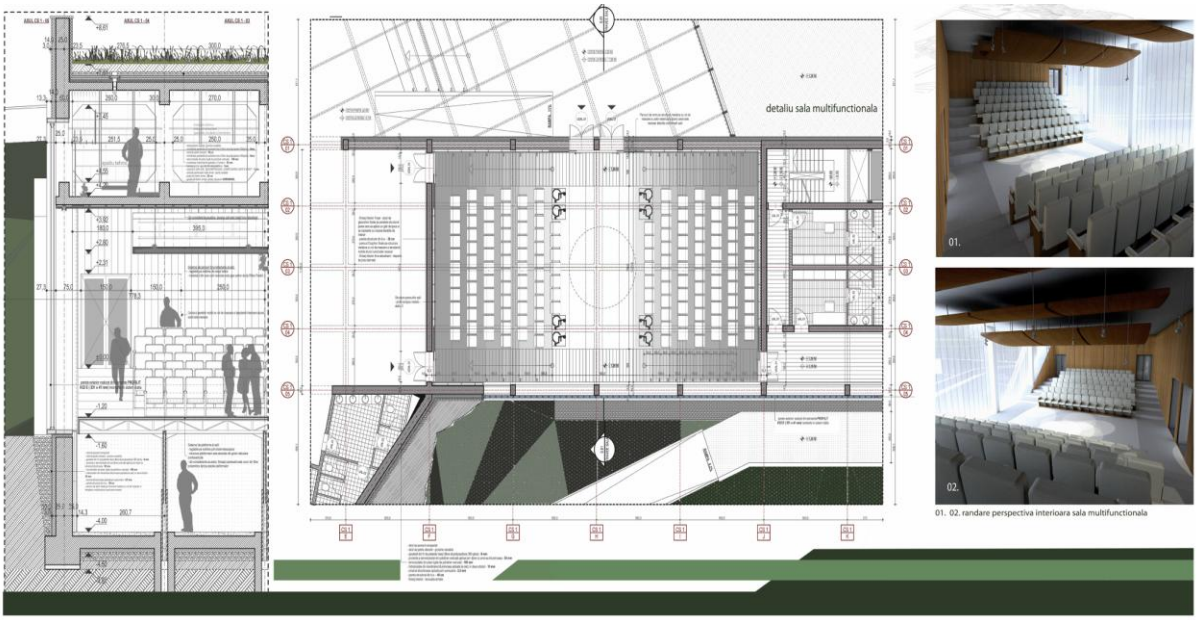



Fig.8 Details and general plan sheet of Cultural Center "Pană Filipescu Mansion" auditorium

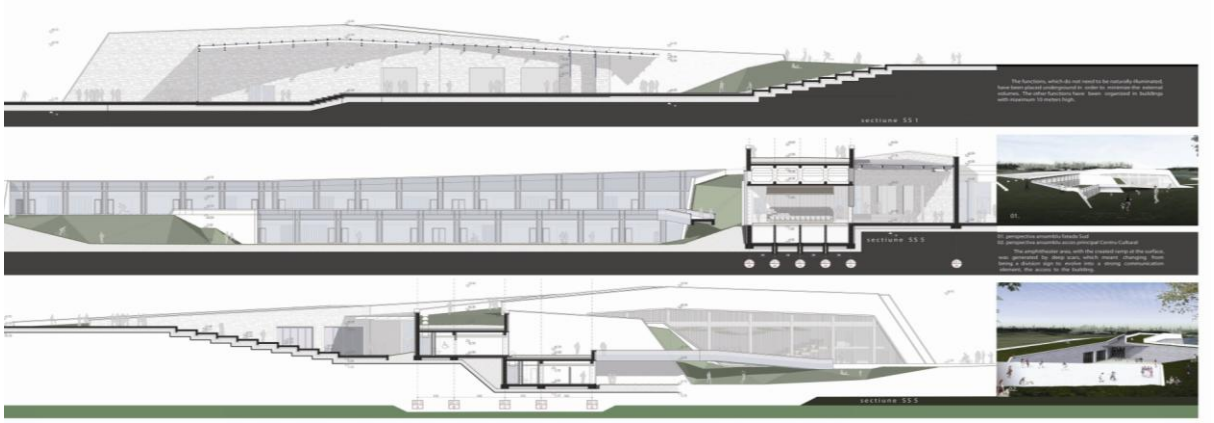


Fig.9 Sections plan sheet of Cultural Center "Pană Filipescu Mansion"

With its numerous possibilities (the platforms on pneumatic pistons allow the floor to be easily reconfigured) like: be able to convert a level into a cinema or be able to have modules that restructure floor and space or stage installations that take and give everything, the auditorium is the "place" where socialization is encouraged. Flexible lifting and transport platforms allow you to adapt the auditorium's topography to each and every event, from the perfect setting to your product presentations. Professional video, lighting, and sound installations turn your main event into a genuine highlight. The wall at the back of the hall is a vertical gate that can be lowered into the floor. The auditorium foyer and the auditorium can then be used separately or together.

There are limitless possibilities because all of the stage installations you need are fitted with in the auditorium. From a range of extendable stages to a multipurpose turntable, everything is possible, it has been conceived like a technologically advanced black box. The dressing rooms, storage spaces, and technical functions have been placed around.

Although the historic site was affected by extra-urban interventions carried out in time, the entire design is built upon respect for the site and sustainable principles. The building features many energy efficient systems through correct building orientatin (different microclimates on the front vs. the back of the building due to the amount of shade and sun orientation- daylight optimization), new technological procedures including lake water pumping, photovoltaics and sustainable materials (a building's design is intrinsically linked to its materiality). This series of sustainable principles bring out the importance of regarding every space's future.

Fig.10 Details, facades, interior design and perspective of the main access to the building plan sheet of Cultural Center "Pană Filipescu Mansion"

In terms of the Cultural Center's exterior cover, green roofs were the effecient and intuitive idea. These roofs provide a wide range of benefits to the surrounding environment, being generally defined as either "extensive", " biodiverse" or " intensive" indicating on their functional use. In this case, for achiving high quality, biodiverse roofs were used, being another form of semi-extensive green roof, meaning both low maintenance and making use of recycled materials.


Fig.11 General perspective of the main access to the building plan sheet of Cultural Center "Pană Filipescu Mansion"

Green roofs are well-known for the benefits of reducing the heating and cooling costs by insulating properly the roof for both the heat of the sun, as well as cold from winds. In addition to this, green roofs that were designed for the "Pană Filipescu Mansion" Museum, also reduce the "heat island effect", effect that appears when buildings absorb the heat of the sun and release that heat through convection. The process of convection can raise the local temperatura over 6 degrees Fahrenheit producing a general discomfort.


Fig.12 General outdoor perspective and interior perspective of Cultural Center "Pană Filipescu Mansion"

The Pana Filipescu Mansion with its dynamic façade, appears different from all angles. Its interior is designed with few structural constraints. Its environment design will adapt to multiple cutural- work styles being open and flexible. Communication and knowledge sharing interaction among staff is encouraged, that is one of the Cultural Centre's intended design.

## CONCLUSION

Each new project represents a thorough research that enhances the architectural experience and sharpens ones approach. This idea has the freedom to push boundaries and challenge traditional thinking.


Fig.13 General outdoor perspective of Cultural Center "Pană Filipescu Mansion"

In this case the vision adds new and positive qualities to the historic site and surroundings. This happens through careful analysis of the heritage that can be found here and the surrounding buildings. The project's challenges and complexity are a positive creative forcé, a playful and innovative architecture that evolves in something unique in form and purpose.

For its innovative architectural design and exceptional interaction between different elements and aspects both in terms of designing buildings and social response, the Cultural Center "Pană Filipescu Mansion" has been nominated a the "Eco-Architecture" 2012 Annual Architecture of Bucharest thus underlining its perfect accordance with urban and cultural context making today's work tomorrow's architectural heritage.

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## IMAGE SOURCES

Fig.1-13 *"Eco-Architecture" 2012 Annual Architecture of Bucharest-* arch. Luca Matei Stoian, project nominated, images by author

# INHABITING RUINS. ENABLING SPACE, TIME AND MEMORY OF ARCHAEOLOGICAL SITES THROUGH CONTEMPORARY PERFORMANCE

**Oana Anca ABĂLARU**[1]

[1]*Ion Mincu University of Architecture and Urbanism Bucharest (ROMANIA)*
*oana.abalaru@gmail.com*

## Abstract

Throughout history, architectural legacy has not only been a continuous ABC for professionals, but also an identity element, a coagulation factor of the masses as part of a collective heritage. Even more we have to worry about the distance that the contemporary man unconsciously takes from the past and, in particular, from archaeological sites, many just outdoor museums or showcases, governed by the rule of "do not touch". Becoming less anchored in everyday life of man, the traces of the past reveals themselves as presences but not as participants to public life.

For the modern man, his reconciliation with the past and the process of anchoring in history goes beyond studying and visiting actions, activities that establishes a distance between man and environment, involving an operating body based on more than the visual sense. Francoise Choay talks about the need for new kinds of juxtapositions, about a review of the relationship civilization-heritage of "being together" [1].These new types of configurations questions the physical limit, "the offering" of the vestiges, surpassing the facade and unveiling the internal laws of the monument.

This paper investigates the possible relation between performance field and urban archaeological sites. At first glance, the interference between archaeological framework, witness of continuity and sustainability, faces a system dominated by temporary and ephemeral that privilege the moment. The gain of this contrasting juxtaposition is a tension simultaneously beneficial that, on the one hand, activates the archaeological context, making it partaking in this moment and, on the other hand, uses, in the contemporary show, the acoustic, scenographic and identitary qualities of the historical buildings. At another reading level, this juxtaposition of materials time tested, proofs of stability, with materials whose physical presence disappears once the artistic act ends can only inspire in the viewer mind reflections on history lessons and the condition of the present existence.

Terme di Caracalla in Rome is one of the first experiments that simultaneously puts together moment with memory, past with present, permanence with impermanence. Used since 1937 as a framework for opera shows, the Roman theatre acts synergistically in regaining the ancient heritage and the urban space. This "otherwise" of the urban fabric, the archaeological site, exceeds its icon condition, inviting the public to understand his essence. Proposing four fundamental themes: recognisability, unity, ability and reversibility, Lucio Altarelli's recent project aims to relate new activities with the building, starting from the understanding of its compositional principles.

Another example with resonance in the cosmopolitan world is the Roman amphitheatre in Verona, with a continuity of over 200 years of recent performance activity. Recovery intentions of the monument, dating from the Renaissance period, are seen in

nowadays configuration and materiality. Hosting shows, concerts and theatre performances the building was one of the ancient structures that caught the attention of professionals and national authorities, setting an example for further interventions on urban archaeological sites instead of sites scattered in the region, as it was the trend until 1960.

These two successful symbiosis have encouraged such urban policies that have dissolved the defensive function of such the emblems of the past: ruins. The consciousness that such intentions have their starting point in urban decision makers and that they should be corroborated with new social habits, this is the great achievement that continues to enrich the urban context.

**Keywords**: Archaeological sites, performance, identity, scenography, symbiosis, integration.

## 1 GENERAL CONSIDERATIONS

Since ancient times, the existence of traces from previous civilizations was a premise and a guarantee for the durability of the new architecture. Building upon preexistance, a fundamental process in the formation of urban palimpsest, essential for the survival of urbanity, in the sense of urban continuity, can and must be subject for the architectural inventiveness. This paper investigates a series of directions seen as compatible activities and building possibilities.

Nature has always taken over the urban space whenever human activity has not programmatically oriented in this direction. In the case of ruins or archaeological remains, this situation was reflected in the romantic image that blended natural and anthropic elements, creating a scenery that, nowadays, performaces, especially opera, aches for. Although in some cases ancient buildings had a functional continuity, most of them have become open-air museums and only a few entered in the stream of everyday activities. This situation leads today to a number of intriguing questions. What can be the role of ruin within the processes of the everyday life, or as part of exceptional performance events? How can architecture encourage such activities?

Standard definitions of archaeology usually refer to terms like time, past, human life, ancient people, monument, fossil relics, history, trace, habits, location, value systems, tradition and so on. Archaeology can be thus considered only a frozen form of everyday ritual that contemporary man follows? How can this interfere with our constant psychological desire for spectacles?

This paper seeks for a potential symbiosis between archaeological areas and performance activities, identifying possible types of relations, so that the historical monument may preserve its character while becoming an active component in current urban perception. About the mission of new interventions in archaeological sites F. la Cecla, compares it to a written opera: "the most honest form in dealing with the city and space, because writing does not kill, does not want to reinvent it, does not claim to consume. The writing accompanies and comforts stones and people that inhabit them, recounting the process when rocks and persons meet"[2]

## 2 INTERFERENCES

### 2.1 Educational values of the archaeological heritage

The environment we live in, especially the urban area, whose transformation is profoundly accelerated, defines and is defined through human existence. The eighteenth century was a fundamental period for the didactic character that past gain in the awareness of modern man. Trigger by the new discoveries of Antiquity's cities, the experiences of European intellectuals in confronting Greek and Roman archaeology become recurrent, known as "Grand Tours"[3].

Beyond these formative journeys that underpinned new theories of knowledge, another phenomenon expanded before the beginning of the nineteenth century - the antiquarianism, whose major ambassador in England was architect Sir John Saone. Designing his own home located in Lincoln's Inn Field neighborhood of London, the architect conceive the whole space around manuscripts, decorative pieces, vases, friezes, ancient statues and other rare objects, collected from territories once dominated by ancient Greek and Roman civilization. [4] Motivating this act in the pedagogical character this type of conservation can have, Sir John Saone brings together ancient remains and items of contemporary furniture or drawings with the stated purpose of educating and training further professionals in architecture [5]. This invasion of private space by ancient fragments, inevitably led to an impoverishment of the archaeological heritage.

Karl Friedrich Schinkel is one of the first who understood that the gesture of repositioning the ancient fragment is beneficial in a collective space of education and should not be deprived of critical interpretation. The architect of Altes Museum in Berlin, declares, both in the overall architectural composition and in details, the principles of Greek and Roman spatial organization. The building, designed for an urban environment, is partially revealing its ancient content.

Another significant moment is distinguished by Antonello Marotta [6] in the modern architecture intention expressed in the works of Mies van der Rohe, Le Corbusier and Louis Kahn, to recover the archaeological dimension as the basis of the museum or urban project. These new expressions of the ancient buildings interaction with the actual urban context don't pose the problem of imitation, but represent a continuous search for architectural expression. The first echoes of the dialectics between the modern city and the archaeological one raise new issues among architects: memory, continuity, space and matter. The need for a systematization of urban major archaeological sites from the two outpost cities of Antiquity, Rome and Athens, whiped up multiple concerns among theorists of the 70s'. For instance, in the Mediterranean space, the forms of recovery and integration of the past depository become cultural models. The vocabulary of absence becomes a direction in the expression of memory or traces of the eroded past.

All these researches mentioned are still an active lode, with multiple ramifications. Contemporary architecture visions reflect multiple perspectives on history, refusing a unique paradigm and a single way of investigation. Heritage involvement in educating the common people, but especially the professionals is a goal still hard to reach in our society. Even so, there is a clear direction that the participation of inherited values is essential in the formation of community. In the era of speed, anchoring the man in history and overcoming the alienation feeling is one of the problems looking to be answered through the relation archeology - architecture.

## 2.2 Archaeology and performance activities

Francoise Choay, considering the interaction between heritage and civilization, supports the theory that thinking about patrimony should ignore the current social crisis involving "a recognition and a new approach to urban and architectural heritage." [7]. This new vision, Chaoy says, involves the invention of "new spatial configurations of togetherness." [8] Even if the author reflections refers to the continuous overcoming of the limits between city and rural settlement, it is no less true that the same phenomena we encounter at a micro level, when we speak about spatial continuity in current urban archaeological configurations. This togetherness involves overcoming physical limitations, rediscover and explore the intimate space of the ruin. The new spatiality question the vicinity of ruin or the city, changing the point of view from the exterior/city towards the interior and its power to evoke and educate. Once the limit of the facade surpassed, the private space of the monument, governed by inherent rules adapted to the human scale, reveals. The building offer itself and the human understand it, integrating it into his one system or values, following a more natural process. Far from the contemplative state of the romantic ideals toward the emblems of the past and even from the contemporary museification, this dynamic relation with the past gains back the function of the model. Furthermore, it assumes complex spatial experience that integrates acoustic knowledge, compositional principles, aesthetics, spatial scale, honesty in the use of materials and the basic laws of construction. Nothing less true, in the contemporary society, some experiences of interfering between urban activities and archaeology, besides the appropriation feeling, led to degradation, as, indeed, did the passage of time or the ignorance.

Studying, visiting, exploring or questioning the architectural and urban heritage are today, undoubtedly, fundamental tools in the reconciliation of the past with life experiences. Investing archaeological sites, with a strong urban presence, with new activities, leads the way to the legibility of ancient fragments, otherwise timeless, reduced to structural components.

The interference of current temporality dictated by contemporary human aspirations with the cultural context of an archaeological site creates a simultaneously beneficial tension between a priori and present, continuity and transitoriness, inducing a fertile existence - pre-existing relation. History gains a decisive role in shaping human perception without ever denying its origins. Considering the archeology as foundation stone of a project, new architectural interventions explore, through contrast, the ruins and urban social activities.

Because it involves the encounter of two apparently opposite fields: the existing construction and performance activities, show presence in archaeological areas involves confrontation between various disciplines: architecture, museology, restoration, art, performance, multimedia, lighting design etc. The result should enrich simultaneously duration and event, memory and change, ancient forms and the need for renewal. [9] The new project has the role to activate the monument in present starting from the pre-existences primacy. The visitor of archaeological sites, wants, when he discovers the ruins, to create a bridge between his experience and that of his predecessors. Through pathways, surfaces and materials, designing in such an area should strive to recompose an identity, through which, the illegible fragment may regain the ability to express lessons of the past.

## 2.3 Case studies

A first project considered for this perspective, Baths of Caracalla in Rome, has been used, since 1937, in performances organized by Teatro dell'Opera (Fig. 1). The proposed project of Lucio Altarelli establishes four fundamental themes: axiality, recognisability, unity and

reversibility [10]. In the first place, the intervention understands the monument as memory, sedimented form of the past, while the recognisability is gained by using diffuse and seemingly fragile items that preserves the integrity of the remains. Assembly unity is given by the recurrent use of gestures and materials in a unitary construction technique, so that the result is an integrated design of spaces. For this type of temporary intervention, reversibility is a fundamental principle, for the structures to be disassembled at any time. Physically, this principle translates into using disassemble elements and minimizing the contact points between new and pre-existence.

The effect of such architectural choice is the breakthrough, in-depth study of the monument, starting from its heterogeneous perception, an "otherwise" integrated in the urban tissue as a reference to an external system. Referring to the monument, a second step is tapping into its inner logic as a guest, by overcoming its envelope while still maintaining the distinction between the perceived object and the observer values. The moment in which the emblem of the past become a "home" for recurrent human activities, exceeding and status of "do not touch the exhibition", is fundamental for the recognition of its new type of presence in our consciousness. Its participation adds importance and enactment of our urban life as an active theater, with elaborated acoustic and scenic qualities, determining the recognition and affirmation of past values as well as their educational function.

Fig 1. Baths of Caracalla in Rome, Roma – Attila Opera.

Source: http://estatecaracalla.operaroma.it

The proclivity of artistic activities towards escaping a dedicated space, defying the physical limits of a buildings and giving birth to a new field of interaction, is a common practice of the new century. If the interference with adjacent public space is a first level of the artistic manifestation of irradiation, the "contamination" of an ancient edifice involves a superior complexity, assuming the metamorphosis of the actual representation and of the ritual of consuming a performance.

Another building with a remarkable continuity in mediating this interference is the Roman amphitheater in Verona. (Fig. 2,3) Starting with the eighteenth century, the famous Roman edifice had hosted large theater and opera events. With a capacity of over 15,000 spectators [11] at a single representation, it became an attraction for cosmopolitan audience. Involving the public space of the Bra Square, the Roman amphitheater arena in Verona announces, in a discrete manner, the reactivation of the function of urban scene. The building, reduced to its structural component, becomes a permeable boundary, facing the public space, a curtain frozen in time but partaking at the urban life.

Fig. 2. Roman Amphitheater in Verona

Source: http://www.eventiverona.it/?page_id=529

Fig 3. Roman Amphitheater in Verona - aerial view

Source: http://i.guim.co.uk/static/w-620/h--/q-95/sys-images/Guardian/Pix/pictures/2013/

10/11/1381499022435/Verona-Arena-012.jpg

Such initiatives of reactivation of the archaeological heritage irradiated from Europe to the Middle East, becoming successful in countries like Israel or Jordan. The israelian festival, although still very young, had an itinerant evolution, taking place annually in locations like the edge of Masada plateau or the Old City of Jerusalem (Fig. 4,5) [12]. It became the second

most important opera festival in Israel. The proliferation of the event among international audiences and artists was strongly influenced by the expressive qualities of ancient monuments which serve as background as well as by the emotional charge transmitted through the artistic act. The performance is an immersion into the protected ancient archeological area that acts like a pinnacle for the massive stone plateau, absorbed in support matter, perceived as a true natural sanctuary frozen in time.

Fig 4. Masada Fest - Israel

Source: http://www.israel-opera.co.il

Fig 5. Masada Fest - Israel

Source: http://www.israel-opera.co.il

In the same geographical area, the capital of Jordan, Amnan hosts isolated events in the attempt to integrate the Roman Theatre in everyday life of the inhabitants. The theater representations or open air concerts are some experiments to enter into the nature of the ancient edifice (Fig. 6,7). These initiatives show an awareness of the need for building participation to the present by overcoming the exhibit status of the foreign archaeological object. "Invading" the interior space of the ancient monument implies, first of all, a conscience of the differences between internal rules system and external causality.

Fig 6. Hamlet at the Roman Theater Amman

Source: http://jordantimes.com

Fig 7. Concert at Roman Theater Amman 2013

Source: http://www.last.fm/venue/10326317+Roman+Theater

Concerns about ways of questioning the relation with historic past and adopting a certain position relative to them, start to turn echoes on urban decision-makers. A well-known example is the case of an archaeological area in the Spanish city of Tarragona. Began in 1998 with the intention of an international cultural event that brought closer the history of the Roman period, Tarraco Viva festival is held annually ever since (Fig. 8). The activities, such as workshops, screenings and concerts, take place in the vicinity of the Roman buildings, representative ruins among which the circus, the amphitheater and the aqueduct. [13] Open to the general public, the manifestation places the ancient buildings in the sphere of tangible inviting to new interpretations and understandings.

Fig 8. Tarraco Viva Festival, Tarragona Spain

Source: http://www.tarracoviva.com/en/multimedia/in_images/2013_image_gallery/

## 3 CONCLUSIONS

Returning to the performance - archaeology dialectics, the actual almost limitless possibility of current technologies in the field of music, shape, color can make from an archaeological site artistic a genuine participant in the message. In this composition, the new layer enriches its signification, becoming, temporarily, the voice of another story. This transfiguration of the space means an appropriation of the place that participates in the social life of the city. From the opposite perspective, an artistic act in an archaeological space carry a message in an environment already rich in historic significance, through a dialogue that becomes positive and mutually stimulating.

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# GERONTOASSIST

# INTERDISCIPLINARY TRAINING PROGRAM

# -MULTIDIMENSIONAL ASSISTANCE OF ELDERLY IN FAMILY AND COMMUNITY-

**Mihaela ZAMFIR (GRIGORESCU)[1], Mihai-Viorel ZAMFIR[2]**

[1] *"Ion Mincu" University of Architecture and Urbanism (ROMANIA)*
[2] *"Carol Davila" University of Medicine and Pharmacy (ROMANIA)*
*mihaela_arhitect@yahoo.com, mihai.zamfir@yahoo.com*

**Abstract**

**Motivation:**

*According to data provided by UN, we are currently witnessing a significant increase in the percentage of older people worldwide. Consequently, society must be prepared for these demographic modifications involving changes in all life aspects. Dependency is a serious problem that can occur with advancing age. An important objective of dependent elderly care is to remain in community as long as possible, the* ***AGEING IN PLACE*** *concept.*

*The premise from which we started to think this educational program was maintaining elderly people in community as much as posible, as an alternative to institutionalization. We became aware of the importance of an* ***interdisciplinary approach*** *and consequently of training in this spirit specialists involved in the field of ageing: social workers, sociologists, health professionals, architects, psychologists, theologians, representatives of organizations for the elderly.*

*In this way, we conceived in 2013* ***GerontoASSIST-Multidimensional assistance of elderly in family and community****, as an interdisciplinary training program.*

**Training program description:**

GerontoASSIST training program has proposed to provide principles and practical information regarding care of dependent older people in community, in the spirit of an interdisciplinary approach.

Educational goals were: knowing the importance of elderly maintaining in community; highlighting the bio-psycho-socio-spiritual model and the specific needs of elderly persons; describing the impact of specific problems of dependent elderly people on family and carers; highlighting the importance of community solidarity for elderly support; knowing assistance systems for the elderly and ways to access them; establishing of a structure of interdisciplinary collaboration between different types of care for seniors.

Synopsis topics:

- Biological aspects of ageing-1h;
- Psychological problems of elderly-4h;
- The issue of family and carers-1h30';
- Social issues in elderly care-3h;
- Architecture's support for elderly-1h30';
- Community support for elderly-2h30';
- Issues of ethics and spirituality in elderly care-4h;
- Telemedicine and AAL-2h;

- Community care models-4h.

Lecturers: 24 lecturers- medical doctors-9, social workers-3, architect-1, psychotherapist-1, psychologists-3, theologian-1, journalist-1, IT engineers-3, working with elderly volunteers-2.

Trainees: doctors(10), psychologists(3), architects(3), social workers(2), nurse(1).

**The role of architect and architecture in the training program:**

Within the training program, architect was present in three roles: lecturer, trainee and interdisciplinary team member.

Lecturer architect:

Assistant Professor PhD. Arch. Mihaela Zamfir (Grigorescu) gave two lectures:

- *Ageing in place - ageing in community. Contemporary models of elderly care, architect's point of view*;
- *Adapting housing for older people- architect's point of view*.

Both presentations are based on research made by us in this field in the last two years. First lecture has analyzed the **options for elderly care**: assistance in community with maintaining of residence; community assistance involving relocation- *Assisted Living Facilities, Adult Foster Care, Continuing Care Retirement Communities;* institutionalized care-*Nursing Homes.* Second lecture detailed architectural principles in adapting housing for elderly.

The offered informations were both conceptual and applied. Presentations highlighted that architecture for today society's requirements is shaped by new parameters related to integration of elderly in community life. Today's architecture is accessible from whole to detail, it is barriers free architecture. Architecture can make people independent, autonomous, prostetical architecture and gerotechnology being subordinated.

One of the major elderly problem is depression resulting from isolation, on the other hand elderly need quiet, privacy, familiar space. Architecture can make the difference between being isolated and having privacy by spatial-volumetric design, indoor-outdoor relation, chromatics, glazing. Contemporary architecture has to answer to the set values of older persons. The community role of architecture was highlighted based on following ideas: architecture can enable communication between generations, architecture must address to the community and boost the community spirit, architecture can fight ageism.

Under these concepts were developed practical informations: accessibility, universal design, flexibility, adaptability, functionality and efficiency, security and safety, aesthetics, sustainability. Architecture of the 21st century is an **AGE-FRIENDLY** architecture for intergenerational communities, establishing balanced relations between generations, confers harmony to the community and constitutes a sustainability criterion for the community. More, contemporary architecture is architecture of all ages.

The lectures on architecture gave concreteness to the training program, offering contemporary principles for achieving a proper physical environment for elderly in two poses: institutionalized and independent, both perspective under the concept **AGEING IN COMMUNITY**, proving itself the capacity of influence community relations.

Architect's perspective was completed by lecturers from related specialties that covered the following issues: community, bio-psycho-socio-spiritual model, medical problems, Ambient Assisted Living, domotics. The training benefits were mutual, and architecture proved the capacity of synthesis discipline.

Trainee architect:

Architects contributed to the dynamics of professional discussions, emphasizing architectural issues and related elements: spatiality, functionality, aesthetics. Community architect is interested in people, community needs and emphasizes social values.

Interdisciplinary team member architect:

The graduation of program was conditioned by participation of trainees in an interdisciplinary team project. The project themes were: *Psychogeriatric care in community, Integrated system of elderly assistance* and *Day Care center for elderly with Alzheimer's disease*. In the final assesment entered one architect and two student architects.

Architects's contribution brought both concreteness and humanizing to the projects.

Trainees architects become aware of the importance of interdisciplinary approach within *Age-Friendly* projects, being capable to work in an interdisciplinary team and building integrative capacities.They could apply bio-psycho-socio-spiritual model acquired during the course within the projects.

**Conclusions:**

In GerontoASSIST training program, architecture completed the perspective on ageing and offered principles for contemporary shaping of an Age-Friendly environment, proving to be an essential component in elderly assistance. Including architecture in an interdisciplinary training program gave a broader bio-psycho-socio-cultural perspective to architects and offered useful informations to the specialists from the other fields involved in assistance of older persons. Final graduation projects provided the opportunity of practical work in an interdisciplinary team, featuring to architects the possibility to obtain all the necessary information to achieve proper projects for elderly. Architects who have completed the training program acquired certain skills and competencies in designing architecture for older people. The program organized by us, GerontoASSIST [Fig.1], is a pioneering project in Romania and we think that such interdisciplinary programs are indispensable today and should be encouraged. We strongly believe that a proper age-friendly architecture can be conceived only by deepening information exchange with related disciplines.

**Keywords**: age-friendly architecture, interdisciplinarity, elderly multidimensional assistance, community, ageing in place, ageing in community

Fig. 1 GerontoASSIST LOGO design by © Mihaela Zamfir (Grigorescu) & Mihai-Viorel Zamfir

# 1 INTRODUCTION

According to United Nations [1] we are currently witnessing a significant increase in the percentage of elderly people worldwide [Fig.2]. Consequently, society must be prepared for these demographic modification involving changes in all life aspects. Dependency is a serious problem that can occur with advancing age. In the same time, another trend of contemporary society is urbanization [Fig.2]. [2] An important objective of dependent elderly care is maintaining in community as long as possible, the **AGEING IN PLACE** concept.

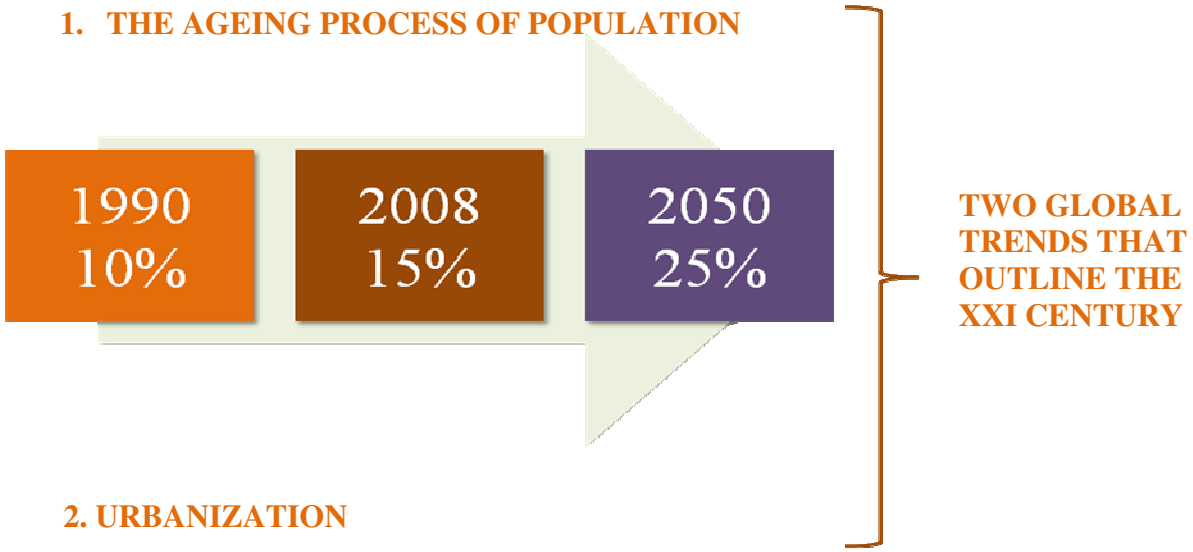



Fig. 2 The global context of GerontASSIST training program © Mihaela Zamfir (Grigorescu) and Mihai-Viorel Zamfir

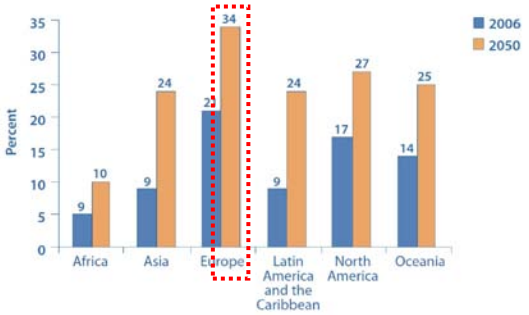



Fig. 3 Distribution of the population over 60 years depeding on the area, 2006 and 2050
Source: WHO Guide, Global Age-friendly Cities, 2007

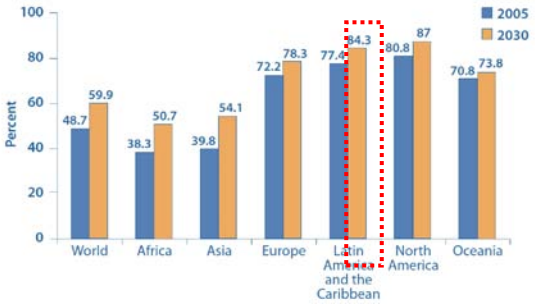



Fig. 4 Percentage of the urban population depeding on the area, 2005 and 2050
Source: WHO, Global Age-friendly Cities, 2007

*Ageing in place* is defined as *remaining living in the community, with some level of independence, rather than in residential care* [3]. Ageing in place enables older people to maintain independence, autonomy, and connection to friends and family [4] and also avoids the costly option of institutional care. [5]

The role of physical home environment in older people's well-being is very important and appropriate housing options also enable links to family and friends to continue; although most discussions on ageing in place focus on home, there is growing recognition in environmental gerontology that neighbourhoods and communities are crucial factors in people's ability to stay put. [4]

Ageing in place must be suported by various policies and programs designed to maintain independence and to encourage participation of older persons. The range of such policies and programs is broad and include care support, finances, ageism combating initiatives, media initiatives, integrated care initatives and, the last but not the least, training programs for professionals.

The importance of education has been characterized as central for improving of long term care, the concept of *teaching nursing home* being put forward as an effort to improve the qualities of professionals involved in the care of elderly [6]. Continuous professional development is essential to keep up with novel concepts, ideas and perspectives in the care of older people, social and gerontological theories and also medical updates and best

practices. Thus, a program for integrated of care of older people is a prerequisite of success of care and support programs for elderly people.

Care of older people must be personalized, integrated-interdisciplinary and coordinated, adresing needs but also beeing person-centered, focussed on quality of life. dignity and empowerment.

In addition to adressing needs of individuals, care must be planned and provisioned using a population/group-based approach [6]. Assessment of needs of the group beeing the benefficiary of care must be a key component of service development and delivery [7].

The premise from which we started to think this educational program was maintaining elderly people in community as much as possible versus institutionalization. We became aware of the importance of an **interdisciplinary approach** and consequently of training in this spirit specialists involved in the field of ageing: social workers, sociologists, health professionals, architects, psychologists, theologians, representatives of organizations for the elderly.

With the concept of *learning nursing home* in our view, we used the approach of **LEARNING TEAM**. We also wanted to include a team project in wich trainees ***practice*** acquired knowledge.

In this way, we conceived in 2013 **GerontoASSIST-Multidimensional assistance of elderly in family and community**, as an interdisciplinary training program.

## 2 TRAINING PROGRAM DESCRIPTION

The program were developed within the Romanian Association of Young Geriatricians [8], a professional association of which main purpose is promoting quality health care for elderly people. GerontoASSIST [Fig.12] develope in an interdisciplinary manner the 2011 [Fig.10] and 2012 [Fig.11] workshop editions, *Elderly patient care at home*, expanding curricular area and opening up various profesionals involved in the elderly care, including architects. GerontoASSIST is a part of the wider program GeroHOMEASSIST-*The interdisciplinary assistance of elderly patient at home*. Project manager is Mihai-Viorel Zamfir [Fig.5].

GeroHOMEASSIST [Fig.9], coordinated by Assoc. Prof. PhD Md Gabriel-Ioan Prada has four sections:

1. *Qualified home care for elderly*-coordinated by Prof. PhD. MD Gelu Onose;
2. GerontoASSIST, *The multidimensional assistance of elderly in family and community*- coordinated by Prof. PhD MD Constantin Bogdan, Assoc. Prof. PhD Denizia Gal and PhD MD Radu Vraşti;
3. *Geriatric Pathology*-coordinated by Assoc. Prof. PhD MD Gabriel-Ioan Prada;
4. GeroPSI-*Approach of the elderly with mental diseases in the context of home care* – coordinated by Prof. PhD MD Cătălina Tudose, Assoc. Prof. PhD MD Gabriel-Ioan Prada.

Fig. 5-8 Photo during the training program © Mihaela Zamfir(Grigorescu)

GerontoASSIST is distinguished as the most developed section, counting 25 hours of lectures and with the largest interdisciplinary opening.

GerontoASSIST training program has proposed to provide principles and practical information regarding care of dependent older people in community, in the spirit of an interdisciplinary approach.

An important goal of dependend elderly care is represented by the maintaining them in community as long as is posible, the *ageing in place* concept. Ageing in place can be done only by the existence of diversified and integrated support services, by active community involvment.

In order to achieve these goals, a thorough understanding of the medical, social, psychological and spiritual needs of elderly people, and also of families and carers is required.

The complex pathology and the specific social status involve collaboration between professionals from various fields. The integration in community, respect for personal preferences and promoting autonomy and Independence are principles that guide the organization of support services.

This training program has proposed to provide principles and practical informations regarding dependent elderly care in community, in an interdisciplinary approach [Fig.4].

**Educational goals** were: knowing the importance of elderly maintaining in community; highlighting the bio-psycho-socio-spiritual model and the specific needs of elderly persons; describing the impact of specific problems of dependent elderly people on family and careers; highlighting the importance of community solidarity in elderly support; knowing assistance systems for the elderly and ways to access them; establishing of a structure of interdisciplinary collaboration between different types of care for seniors.

Synopsis topics:

- Biological aspects of ageing-1h;
- Psychological problems of elderly-4h;
- The issue of family and carers-1h30';
- Social issues in elderly care-3h;
- Architecture's support for elderly-1h30';
- Community support for elderly-2h30';
- Issues of ethics and spirituality in elderly care-4h;
- Telemedicine and AAL-2h;
- Community care models-4h.

Fig. 4 Santa Rita Geriatric Center
Source;http://www.archdaily.com/24725/santa-rita-geriatric-center-manuel-

**Lecturers:** 24 lecturers- medical doctors-9, social workers-3, architect-1, psychotherapist-1, psychologists-3, theologian-1, journalist-1, IT engineers-3, working with elderly volunteers-2.

**Trainees:** 19 graduates- medical doctors(10), psychologists(3), architects(3), social workers(2), nurse(1) [Figs.6;7;8]

Fig. 9 GeroHOMEASSIST 2013
-Framework Program
Design © Mihaela Zamfir(Grigorescu)




Fig. 10 Background_Course 2011:
Assistance of Elderly Patient at home-
Design © Mihaela Zamfir(Grigorescu)


Fig. 11 Background_Course 2012:
Assistance of Elderly Patient at home-
Design © Mihaela Zamfir(Grigorescu)

Fig. 12 Interdisciplinary training program
GerontoASSIST 2013 Event's flyer
Design © Mihaela Zamfir(Grigorescu)

## 3 THE ROLE OF ARCHITECT AND ARCHITECTURE IN THE TRAINING PROGRAM

Within the training program, the architect was present in three poses: lecturer, trainee and interdisciplinary team member.

### 3.1 Lecturer architect

Assistant Professor PhD. Arch. Mihaela Zamfir (Grigorescu) [Figs.13; 18] gave two lectures:

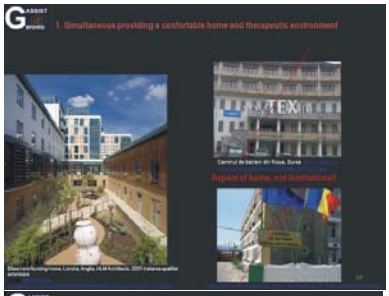
- *Ageing in place - ageing in community. Contemporary models of elderly care, architect's point of view*;
- *Adapting housing for older people- architect's point of view*.

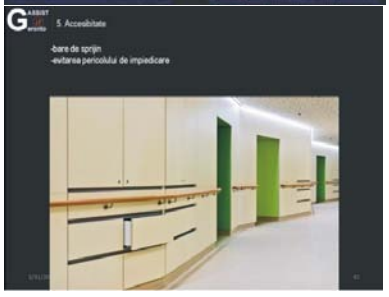
Both presentations are based on research made by us in this field in the last four years.

**First lecture** [Figs.14;15;16;17] has analyzed the **options for elderly care**: assistance in community with maintaining residence; community assistance involving relocation- *Assisted Living Facilities, Adult Foster Care, Continuing Care Retirement Communities;* institutionalized care-*Nursing Homes.* [2], [9]

Assistance in community with maintaining residence implies home care services and other social and medical services, *Adult Day Care*, *Elderly Community Centers*. Elderly community centers must provide a proper environment for carrying out various activites: arts and crafts, musical entertainment, intelectual stimulation games, group discussion, physical activities, celebrating birthdays and events, lifelong learning.

Speaking about relocation, *Assisted Living* represents a contemporary option for long term care. It combines dwelling, social and medical services in various percentages, depending on residents needs. In specialized literature it is found under the names *Assisted Living Facilities* (*ALF*), *Adult Care*, *Residential Care*. A more complex and complete assistance is offered by *Continuing Care Retirement Community (CCRC).* CCRC represents a complex form of community that can provide assistance on different levels, from independent dwelling or partial assisted to nursing homes. Completing care levels take place in the community. The concept of ageing in place acquires other dimensions, in order to age in community one need to move into community in order to start getting older. *Nursing Homes* are medical and social assistance institutions dominated by the medical component. Nursing Home is adressed to older people with chronic health problems, to the patients that require continuing care, treatment and recovery.


From left to right
Fig. 13 Arch. Mihaela Zamfir (Grigorescu)__28.10.2013 © Sabin Prodan
*Ageing in place - ageing in community. Contemporary models of elderly care, architect's point of view*
Fig. 14-17 Slides from lecture © Mihaela (Grigorescu) Zamfir

**The second lecture** offered in a concentrated manner and with an interdisciplinary opening informations about adapting housing for elderly people, highligting the importance of the environment in sustaining autonomy of elderly. [2], [9]






From left to right
Fig. 18 Arch. Mihaela Zamfir (Grigorescu)__28.10.2013-© Mihai-Viorel Zamfir
*Adapting housing for older people- architect's point of view*
Fig. 19-23 Slides from lecture © Mihaela (Grigorescu) Zamfir

Among the factors that transform elderly in a vulnerable person, inadequate housing ranks first.

The dwelling options must be adapted to the specific of the beneficiary, and the architectural program for special categories such persons with Alzheimer Disease rise special problems. [10]

Lecture highlights the principle of reorganization, functional interior adaptation of home starting from elderly problems: home access, adapting horizontal and vertical surfaces, guidelines for orientation, lighting and ventilation of spaces, adaptation of furniture, adapting home for the elderly with Alzheimer dementia [10], [Figs. 19;20;21;22;23]. The differences of adaptation between apartments and single/multiple family house were dashed. Finally, contemporary attitudes in housing design and posibility of thinking housing for life were discused.

The offered informations were both conceptual and applied. Presentations highlighted that architecture for today society's requirements is shaped by new parameters related to integration of elderly in community life. Today's architecture is accessible from whole to detail, it is barriers free architecture. Architecture can make people independent, autonomous, prostetical architecture and gerotechnology being subordinated.

One of the major elderly problem is depression resulting from isolation [11], on the other hand elderly need quiet, privacy, familiar space. Architecture can made the difference between being isolated and having privacy, by spatial-volumetric design, indoor-outdoor relation, chromatic, glazing. Contemporary architecture has to answer to the set of values of older persons. The community role of architecture was highlighted based on the following ideas: architecture can enable communication between generations, architecture must address to the community and boost community spirit, architecture can fight ageism.

Under these concepts practical informations were developed: accessibility, universal design, flexibility, adaptability, functionality and efficiency, security and safety, aesthetics, sustainability. Architecture of the 21st century is an **AGE-FRIENDLY** architecture for intergenerational communities, establishing balanced relations between generations, confers harmony to the community and constitutes a sustainability criterion for the community. More, contemporary architecture is architecture of all ages.

Architectural presentations gave concreteness to the training program, offering contemporary principles for achieving a proper physical environment for the elderly in two hypostases: institutionalized and independent, both perspective under the concept **AGEING IN COMMUNITY**, proving itself the capacity to influence community relations.

The architect's perspective was completed by lecturers from related specialties that covered the following issues:

community, bio-psycho-socio-spiritual model, medical problems, Ambient Assisted Living, domotics. The training benefits were mutual and architecture proved the capacity of synthesis discipline.

## 3.2. Trainee architect

Architects contributed to the dynamic of professional discussions, emphasizing architectural issues and related elements: spatiality, functionality, aesthetics. Community architect is interested in people, community needs and emphasizes social values. Currently, in Romania, there are not architects specialized in socio-medical programs for elderly, thus an interdisciplinary training in approaching specific spaces dedicated to this age group is essential. GerontoASSIST offered to architects trainees a solid interdisciplinary base.

## 3.3 Interdisciplinary team member architect

The graduation of program was conditioned by participation of trainees in an interdisciplinary team project. The project themes were: *Psychogeriatric care in community, Integrated system of elderly assistance* and *Day Care center for elderly with Alzheimer's Disease*. In the final assesment entered one architect and two student architects. All three projects were assesed by an interdisciplinary committee consisting of physicians, psychologists, social workers and IT speciliasts: Prof. PhD Constantin Bogdan, Assoc. Prof. PhD Denizia Gal, MD Mihaela Ceucă, MD Radu Vraşti, IT specialist Elena Poenaru.

*Day Care center for elderly with Alzheimer's Disease* obtained the highest score; team members were: Monica Ciocoiu-social worker and the Project manager, Mădălina Mihaela Dumitru-nurse, Elisabeth Gîndu-physician general medicine, Maria Iliescu-psychiatry resident physician, Andreea Georgiana Marin-psychologist and Mihaela Magdalena Zamfir (Grigorescu)-architect. The leader project approached the following issues: beneficiaries, areas of assistance, functionality (ADL- Activities of Daily Living, IADL-Instrumental Activities of Daily Living), environmental planning-assistance needs of beneficiares, assistance activities, working tools, concepts in elderly architecture, data about elderly day center diagnosed with Alzheimer disease located inside Multifunctional Caraiman Center, exemples of centers for patients with Alzheimer disease, proposed functions, proposal for Multifunctional Caraiman Center, psycho-social, spirituality, support network, interdisciplinary team management, telemedicine-ambient assisted living, media, ethics.

Architects's contribution brought both concreteness and humanizing to the projects.

Trainees architects become aware of the importance of interdisciplinary approach within *Age-Friendly* projects, being capable to work in an interdisciplinary team and building integrative capacities.They could apply bio-psycho-socio-spiritual model acquired during the course within the projects.

# 4. RESULTS

The training program was appreciated by trainees [Fig.26] and lecturers [Figs.24;25] likewise. For trainees, GerontoASSIST represented an important exercise of team work within an integrated program of assistance for older people. The program offered solid knowledge regarding integrated assistance of elderly. The model approached was bio-psycho-social-spiritual, thus completing the professional training for all involved professionals. Equally, GerontoASSIST constitutes a reference model for professional training programs on the assistance of older people in community.

Different to other educational programs, that train individual professionals, GerontoASSIST has aimed to train ***the interdisciplinary team*** of assistance of the older people.

Speaking about the impact of the program on trainees, we had a positive feedback from them, that was quantified after completion of a questionnaire at the end of the program. For architects trainees, the program brought a series of knowledge and skills, essential for projecting a community architecture dedicated to an ageing population; for medical trainees - a broader opening to the psycho-social field and to gerontology; for psychologists trainees - various psycho-social problems specific to older people; for trainees social workers - the integration of social topics in the broader bio-psycho-social-spiritual model; the role of the case-manager, which in most cases comes to the social worker, was also highlighted.

For all trainees, the training program represented an exercise of exceeding the boundaries of their specialities, even a sketch of overcoming the interdisciplinary approach towards a transdisciplinary approach.

Although trainees were on different levels of professional development (from students to experienced practioners), the communication within the courses and graduation projects was good. Inevitably, small but isolated divergences related to collaboration have appeared between trainees of different specialties.

Finally, the graduation projects have shown the importance of teamwork and provided holistic, contemporary answers regarding assistance of older people in community.

The lecturers's feedback was also positive, they enjoyed to teach knowledge from their profesional field to other professions than those to whom are usually in contact. They apreciated trainees's appetite for informations from related fields. Lecturers also appreciated the effort of integrated approach of the elderly care and the inclusion of different knowledge and skills needed for integrated assistance of older people.

GerontoASSIST prooved to be a successful experimental platform for interdisciplinary training and the benefits were mutual, for both trainees who gained interdisciplinary knowledge and acquired a way of thinking in this spirit and for lecturers who experienced an interdisciplinary public, developing new training skills.



Figs. 24-26-photos from GerontoASSIST graduation ceremony
Fig. 24 Committee- from left to right, Prof. PhD Constantin Bogdan, Assoc. Prof. Denizia Gal and MD. Mihaela Ceucă
Fig. 25- MD. Mihai Zamfir, GerontoASSIST project manager
Fig. 26- GerontoASSIST graduates

## 4. CONCLUSIONS

In GerontoASSIST training program, architecture completed the perspective on ageing and offered principles for contemporary shaping of an Age-Friendly environment, proving to be an essential component in elderly assistance. Including architecture in an interdisciplinary training program gave a broader bio-psycho-socio-cultural perspective to architects and offered useful informations to the specialists from the other fields involved in assistance of older persons. Final graduation projects provided the opportunity of practical work in an interdisciplinary team, featuring to architects the possibility to obtain all the necessary information to achieve proper projects for elderly. Architects who have completed the training program acquired certain skills and competencies in designing architecture for older people. The program organized by us, GerontoASSIST, is a pioneering project in Romania and we think that such interdisciplinary programs are indispensable today and should be encouraged. We strongly believe that a proper age-friendly architecture can be conceived only by deepening information exchange with related disciplines.

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# THE BLURRING OF INSTITUTIONAL BOUNDARIES IN THE INTERMEDIATE SPACES OF CONTEMPORARY ARCHITECTURE

**Anda-Ioana SFINTEȘ**[1]

[1]*University of Architecture and Urbanism „Ion Mincu", Bucharest (ROMANIA)*
*anda.sfintes@gmail.com*

**Abstract**

The contemporary society faces itself with a growing tendency towards emphasizing the importance of intermediary spaces. It has been a while now since the intermediate space stopped being a void, a space with no specific function but that of a buffer – deemed necessary by physical, functional, psychological, social reasons. The intermediate space was both independent and closely linked to the adjacent spaces that led to its emergence as a space of negotiation, redefinition and constant retrospection, of impartiality and shorting of rules. Anyway, the new ideas of equality, acceptance, multiculturalism, collective identities, the new, alternative forms of art (which took the biggest step towards blurring boundaries – between high/low culture, public/private, formal/informal) etc. rather emphasize the hybrid aspects of an in-between positioning.

*Hybridity* is a highly valued contemporary concept. Katharyne Mitchell notes, as a fundamental characteristic of hybridity, its dynamism that transforms it rather into a process than into a thing or place. Thus, the importance of a hybrid place resides in its ambivalence, in its capacity to juxtapose opposed realities, values, features, allowing a richness of readings, meanings but also of creative interpretations and uses.

The high number of terms mentioned in *The Metapolis dictionary of advanced architecture: city, technology and society in the information age* – like „ambiguity", „hybridity" and „hybridization", „blurring", „camouflage", „de-materialization", „dispersed", „in-between" and „intermediary" – define the extent, complexity and importance of a mediating *Thirdspace*.

The idea of a *Thirdspace* belongs to Edward W. Soja who thought of the architectural transitional area in a broader sense: as a flexible, creative space, a place where transformative processes objectify themselves, negating, however, a bipolar logic and allowing the coexistence of opposed realities.

His theory (continuing a train of thought started by van Gennep with his *rites of passage* and continued by Victor Turner when writing about *liminality* and *liminoid*; based upon the idea of a continuous *social space* as theorized by Lefebvre) validates our discussion about the blurring of institutional boundaries in the intermediate spaces of contemporary architecture.

These spaces do not necessarily have firm contours, but rather diffuse boundaries which contribute to the conceptualization of the physical and social space as part of a de-materialized culture, visible in the de-materialization (identified by Sreten Ugricic) of art, of communication forms, of conflict or power relations etc.

This dematerialization and blurring of boundaries is sustained not only – or necessarily – by physical characteristics of the built space, but also – or rather – by institutional extents and contemporary social, psychological, economic, political or cultural needs.

The new intermediate spaces mediate, as always, the relationship between an inside and an outside, but they also assume new creative uses, becoming places of performance, where, for

example, the everyday realities and practices mingle with artistic high culture manifestations. Here, formal and informal activities collide, alluring new categories of public to join (at least passively). A major role in blurring boundaries is played also by the intersection, in the same place, of leisure, commerce and more highly cultural activities – indeed as a result of a society driven towards conspicuous consumption but which shouldn't, nevertheless, lead to the neglect of its positive aspects (like encouraging participation, interaction and emphasizing creativity, social integration etc.).

Physical aspects, institutional aims and social work shall all be followed – in this regard – in a couple of case studies, various in their function, scale and status: from small architectural objects designed to fill an intermediate space (like the winning projects of the *Young Architects Program* developed by *MoMA* and *MoMA PS1* in New York as well as by their newly co-opted partners in Rome, Istanbul, Santiago and Seoul), to new, not built yet, projects like Chu Hai College Campus in Hong Kong, designed by OMA having in mind the high social importance of hybridity.

**Keywords**: in-between space, hybridity, boundaries.

The contemporary society faces itself with a growing tendency towards emphasizing the importance of intermediary spaces. It has been a while now since the intermediate space stopped being thought of as a void, a space with no specific function but that of a buffer – deemed necessary by physical, functional, psychological, social reasons. The intermediate space was both independent and closely linked to the adjacent spaces that led to its emergence as a space of negotiation, redefinition and constant retrospection, of impartiality and shorting of rules.

By establishing boundaries we create an inside and an outside, depending upon the place in space occupied by the perceiver, by the motif of his presence etc. Basically, the inside is more protective and can be more easily appropriated due to its perceivable limits, while the limitless extension of a so called outside is more threatening, less controllable and more exposed. However, establishing boundaries is not only a physical process (as they can be invisible, but still active). It is also a sociological one, having logical consequences for the establisher as well as for those around him (see [1], [2]). These logical consequences can restrain or afford passage, behaviours, interactions etc. and their most important aspect might be the ingenuity of the people facing them, in a social context – their constant try to grasp, maintain, interpret, negotiate them or cross them over.

The new ideas of equality, acceptance, multiculturalism, collective identities, the new, alternative forms of art (which took the biggest step towards blurring boundaries – between high/low culture, public/private, formal/informal) etc. emphasize the hybrid aspects of an in-between positioning and its relational character.

*Hybridity* is a highly valued contemporary concept. Katharyne Mitchell [3] notes, as a fundamental characteristic of hybridity, its dynamism that transforms it rather into a process than into a thing or place. Thus, the importance of a hybrid place resides in its ambivalence, in its capacity to juxtapose opposed realities, values, features, allowing a richness of readings, meanings but also of creative interpretations and uses.

The high number of terms mentioned in *The Metapolis dictionary of advanced architecture: city, technology and society in the information age* [4] – like „ambiguity", „hybridity" and „hybridization", „blurring", „camouflage", „de-materialization", „dispersed", „in-between" and „intermediary" – define the extent, complexity and importance of a mediating *Thirdspace*.

The idea of a *Thirdspace* belongs to Edward W. Soja who thought of the architectural transitional area in a broader sense: as a flexible, creative space, a place where transformative processes objectify themselves, negating, however, a bipolar logic and allowing the coexistence of opposed realities. For him, the *Thirdspace* is a place of coexistence for:

> subjectivity and objectivity, the abstract and the concrete, the real and the imagined, the knowable and the unimaginable, the repetitive and the differential, structure and agency, mind and body, consciousness and the unconscious, the disciplined and the transdisciplinary, everyday life and unending history. [5, pp. 56–7]

His theory (continuing a train of thought started by van Gennep [6] with his *rites of passage* and continued by Victor Turner [7] when writing about *liminality* and *liminoid*; based upon the idea of a continuous *social space* as theorized by Lefebvre [8]) validates our discussion about the blurring of institutional boundaries in the intermediate spaces of contemporary architecture.

Victor Turner speaks of an on-the-boundary emplacement which he calls *liminal*, having a great importance in settling down accumulated social tensions (here we can name, for example, religious rites of passage, political ceremonies etc.). A *liminoid* manifestation is a contemporary form of *liminality*, rising from a correspondent set of needs but adjusted to the present-day pace. Thus, a *liminoid* manifestation usually occurs in leisure spaces and it is not mandatory, but it keeps its transformative character, negating the established social distinctions and inverting everyday realities.

In architecture, the blurring of the boundaries and its conceptualisation as a liminal practise (through its flexibility and adaptability, but also through a more thorough understanding of it as part of a continuous social space) emphasises the mediating role of the built space, its (not imposing) social role in guiding behaviour through readable and interpretable cues inscribed in it (see [9], [10]). Also, it highlights the close connection between people and the space they inhabit, diminishing the perception of the built form (just) as an object [11]. Bill Hillier even observes that buildings are being transformed into cultural and social objects, reflecting and influencing social relations, precisely through the relational nature of the boundary [2, p. 16].

These spaces (liminal or liminoid spaces, hybrid spaces, Thirdspaces etc.) do not necessarily have firm contours, but rather diffuse boundaries which contribute to the conceptualization of the physical and social space as part of a de-materialized culture, visible in the de-materialization of art, of communication forms, of conflict or power relations etc. identified by Sreten Ugricic [12, pp. 111–2].

This dematerialization and blurring of boundaries is sustained not only – or necessarily – by physical characteristics of the built space, but also – or rather – by institutional extents and contemporary social, psychological, economic, political or cultural needs.

The new intermediate spaces mediate, as always, the relationship between an inside and an outside, but they also assume new creative uses, becoming places of performance, where, for example, the everyday realities and practices mingle with artistic high culture manifestations. Here, formal and informal activities collide, alluring new categories of public to join (at least passively). A major role in blurring boundaries is played also by the intersection, in the same place, of leisure, commerce and more highly cultural activities – indeed as a result of a society driven towards conspicuous consumption but which shouldn't, nevertheless, lead to the neglect of its positive aspects (like encouraging participation, interaction and emphasizing creativity, social integration etc.).

Thinking of the public space as a space for play and performance sustains and encourages the permanent testing of boundaries, of social dimensions, of norms and values, of imagination etc., in a constant search for understanding the self, as Quentin Stevens [13] notes. Thus, we

can see that this idea of a creative in-between space is part of larger and more complex contemporary process that can be easily grasped by reference to Lefebvre's concept of a continuous social space, now probably more true than ever. The social space is both real and utopic, real and ideal. It brings together the project, its materialization and use, questioning, both objectively and subjectively, the fine line between possible and impossible [8, p. 60]. The social space is a sum of juxtaposed realities, of simultaneous and interdependent facts, allowing multiple readings and interpretations, creative changes and negotiations.

In this context, the new architecture, having itself a mediating character, appears to be concomitantly material and immaterial, thus leading to the assertion that the contemporary space has no boundaries, the new architect working with unclosed, unfinished, incoherent forms [4, pp. 398–9]. In a conflicting view we can, however, see in this dematerializing process a way of stretching boundaries, thus emphasizing the nowadays importance of the transformative and evolutionary processes we become more and more aware of[1].

In this train of thought, we shall see how this new perspective upon the in-between space as a relational, negotiated, interpretable and creative space is being embraced by cultural institutions, following their aims and ends. Three case studies, various in their function, scale and status (from small architectural objects designed to fill an intermediate space to integrative, large unbuilt designs) shall illustrate the potential of such a space not only at a physical, but also psychological, social, cultural, political, economic level.

## Young Architects Program

*Young Architects Program* (YAP) is an annual competition established by Museum of Modern Art (MoMA) and MoMA PS1 in New York since 2000, the main theme being that of designing a multipurpose, temporary and experimental installation that accommodates leisure, socialization and constitutes a venue for the annual Warp Up music series held at MoMA PS1. The winning proposal has been built every year in the courtyard of MoMA PS1 – a space in-between public and private realms. In 2011 The National Museum of the 21st Century Arts (MAXXI) in Rome joined the program and, embracing the idea of a global museum or at least of a global cultural network, YAP also attracted the CONSTRUCTO cultural platform in Chile, The Istanbul Museum of Modern Art and The National Museum of Modern and Contemporary Art in Korea.

As Glenn Lowry, the MoMA director, states, by building something in-between museum and street the activity inside extends beyond the walls in a „provocative, lively, and even fun"[2] way, thus also giving something back to the community[3]. As the theme does not have a firstly cultural intent but rather a social one, it feels closer to a wider public, cancelling the perception of being addressed solely to a knowing visitor, to a connoisseur.

A quick view through the ideas of the winning projects for two of the locations (the courtyard of MoMA PS1 and the plaza in front of MAXXI) will emphasize the extent of the proposals:

*MoMA PS1*

2000 – *Dunescape* by SHoP transforms the arid courtyard into a place where the summer weather can be enjoyed, thus providing shelter for any New Yorker passing by.

[1] For a more thorough analysis of this idea please see Sfinteș, Anda-Ioana. "Spații-limită în antropologia arhitecturală." phD thesis, Universitatea de Arhitectură și Urbanism "Ion Mincu," 2014.

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2001 – *subWave* by ROY exploits the idea of juxtaposed realities transforming the courtyard into a tropical setting.

2002 – *Playa Urbana/Urban Beach* by William E. Massie unites the natural and urban landscape at night through glowing reflections of the sky in the tree pools occupying the courtyard.

2003 – *Light-Wing* by Tom Wiscombe of EMERGENT is a structure inspired by traditional shelters on the beach that becomes a colourful lantern in the night.

2004 – *Canopy* by nARCHITECTS introduces the idea of time transforming natural materials through the bamboo canopy that changed its colour during the summer from freshly cut green to tan. The installation also played with shadow densities, patterns and fog, creating different atmospheres.

2005 – *SUR* by Xefirotarch was a reference to nature through the skeleton structure covering the courtyard.

2006 – *BEATFUSE!* by OBRA covered the courtyard, suggesting an interior space. Small clouds of mist, here and there, played with constantly changing, blurred contours.

2007 – *Liquid Sky* by Ball-Nogues combined nature and technology into a kaleidoscopic installation that suggested blossoming flowers through coloured glass. It also made a reference to the space outside the walls of the courtyard by recreating inside the line of the horizon.

2008 – *P.F.1 (Public Farm One)* by WORK Architecture Company animated the courtyard by creating a living, working farm, changing its colours and textures in time. This projects, as well as those that followed, also address the issue of sustainability.

2009 – *afterparty* by MOS combines the idea of sustainability and passive systems with a design that addresses the return to basics as a viable option for a temporary setting.

2010 – *Pole Danc*e by Solid Objectives - Idenburg Liu called up to a healthy, sporting life. It was an interactive installation made out of recyclable materials, underlining through its lightness and transparency (but also corresponding sound) the relationship between structure and the people using it.

2011 – *Holding Pattern* by Interboro Partners created a strong connection with the nearby community by using objects that, at the end of the show, could be donated. Thus, the awareness of MoMA PS1 could extend beyond its visitors through activities that can be considered as social work.

2012 – *Wendy* by HWKN was a parametric structure that purified air, testing architectural, ecological and social boundaries. Its own physical limits were being questioned through natural extensions (of shade, wind, sound etc.).

2013 – *Party Wall* by CODA was a contemporary aqueduct, accommodating dfferent activities.

2014 – *Hy-Fi* by The Living tested, as well as *Wendy*, the boundaries of architecture, engineering and computational design, but also of sustainability, using a completely organic material that, at the end, returns almost no waste. Through this design, The Living encourages the development of a new perspective towards material objects.

2015 – *COSMO* by Andres Jaque / Office for Political Innovation (a project yet to be built) will create a connection between the urban ground and underground, exposing the

water pipes of the city. The installation will purify water, expressing its purity by glowing.

*The National Museum of the 21st Century Arts (MAXXI) in Rome*

2011 – *WHATAMI* by stARTT is rather a landscape design that introduces natural surfaces and nature inspired objects (like large flowers) in contrast to the concrete and cold surfaces of the museum.

2012 – *UNIRE/UNITE* by Urban Movement Design brought the physical exercise and play into the everyday life. By being relocated afterwards throughout the city, this installation created a closer relationship between the museum and the city, making statements about a healthier life.

2013 – *He* by bam! bottega di architettura metropolitana was a floating balloon that, through its colour, transparency and lightness set a contrasting, changing dialogue with the museum from day to night.

2014 – *8 ½* by orizzontale was an ambivalent portable scene that allowed the performance of both private encounters and public events.

As years passed, the concepts of the winning projects (and the augmented theme) reveal the tendency for complexity as well as the growing concern for sustainability (including the concern for the nearby community). We observe that the building place itself, through its intermediate character, is an invite for liminal designs that question and challenge the physical context, pushing further all sorts of boundaries. Some contestants embraced the idea of temporality and ephemerality, the possibility to recycle, while others saw this contest as a motif for making ground-breaking proposals. In the same time, the idea of addressing to the nearby community is more present in the winning designs of the last years. Also, by making some sustainable processes visible and participatory the public becomes much more involved in the cultural and social activities taking place.

In this context, the extension of MoMA or MAXXI beyond their museum walls – through manifestations that are more entertaining that cultural, through leisure activities that have a much closer relation with the everyday life than with the heterotopic reality inside the museums – becomes very important as it establishes a bridge between inside and outside. The blurring of institutional boundaries in this case draws the public closer to the institution and thus – even if discreet and involuntary – to art.

**The Chu Hai College Campus in Hong Kong by OMA**

This soon to be built project by OMA takes into account the social and educational importance of hybridity. The campus consists of two parallel buildings (which accommodate the classrooms, the offices and the workshops) and an in-between space (dedicated to socialization, consumption and leisure activities) formed by successive ramps and platforms.

This intermediate space blurs the institutional boundaries by allowing and even encouraging the interaction between students studying different disciplines in spaces like the cafeteria, the library or the gymnasium. It should become a very dynamic space, non-formally and informally sustaining the academic activities. Its protected but still intermediary character should create a favourable environment for opening up creative dialogues that would further lead to naturally developed multidisciplinary approaches and research.

**Piraeus Antiquities Museum by PAR**

The last case study is a contest submission for the Piraeus Antiquities Museum in Athens, Greece. This project transforms the façade into an intermediary space that not only mediates the inside – outside relationship, but it also develops its own function. The depth of the façade negotiates the affiliation of the space it forms to either the inside or the outside. Carvings made into the volume become pretexts for conceding space to the outdoor activities. They can accommodate spaces of performance, stages, alluring a greater public to take part in liminal manifestations – in non-formal and informal activities, set up by the institution but having a much closer connection to the everyday life that to the exhibition inside the walls. Such an approach underlines the need of contemporary institutions to extend beyond their walls and to address matters that are not only cultural or educative, but also social. The most important outcome of this tendency might be the transformation of an in-between space not only into a space that mediates physical, social, political relationships, but also into a space that creatively draws the public closer to the museum, sometimes showing, in an inexplicit but successful manner, how can the inside activity be interpreted and used in everyday life.

## CONCLUSIONS

The growing attention paid to in-between spaces – both by the institutions (through the activities they organize beyond their walls and through the aims they establish as part of their involvement programs inside the communities they service) and the designers (visible especially in the concepts of contest submissions) – speak of their recognized importance in the contemporary world.

Their exploitation represents a non-abusive and more comprehensible way of extending the activity taking place inside the walls and of getting closer to the public. They are, in the same time, more easily appropriable through their more direct reference to everyday life.

The manifestations that take place in such spaces are usually non-formal or informal, thus at least creating the impression of a minimum institutional engagement and of a greater liberty for the public to creatively change the setting. They emphasize the applicability in everyday life of, for example, high culture information and knowledge, thus cultivating a higher understanding and capacity of reading and interpretation amid a much wider public.

This institutional opening towards an unknowing public is highly criticized by high culture experts that see in this tendency the death of the museum or the gallery, for example [14]. However, in the present-day society, the social work of such institutions is highly valued as a visit to the museum proves to be beneficial for the self, the pair, the family or for various groups of people [15].

An in-between space acts as a space of negotiation and control as it contributes to the tuning of the activities taking place on one side or the other so that the institution works at its best, meaning it succeeds in serving as many people as it can without making quality compromises. It can also be considered an instrument for testing the compatibility between the institutional main function and the wide public.

An intermediary space is a rich anthropological space and its understanding and implementation beginning with the design phase can conceal many advantages both for the institution and its public. Thus, the blurring of institutional boundaries in the intermediate spaces of contemporary architecture is a reality that deserves to be understood and exploited.

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# THE CURIOUS CASE OF CANNIBALISM IN ARCHITECTURE:

# A MODEL FOR SUBURBAN REDEVELOPMENT

**Djordje Stojanovic**

*University of Belgrade, Faculty of Architecture (SERBIA)*
*ds@4ofseven.com*

**Abstract**

This paper presents prospects and limitations of the architectural design research methodology transposed from a specific product development and marketing strategy, first developed in the sixties under the name of "Cannibalism". Practical dimension of the research, concerned with the application of such methodology in architecture, is focused on the following questions: How to convert purely commercial and car dominated zones into the mixed-use environments by their very own creators? And what design methodology can foster such change? The link between architectural research and practice is established through testing of such transposition in the real-life situation present in suburban environments. The chosen testing grounds are outlet parks and commercial zones most commonly situated alongside busy traffic routes.

**Keywords**: Cannibalism; urban design; change of use; adaptive development strategy;

## 1. INTRODUCTION

This paper presents prospects and limitations of the architectural design research methodology transposed from a specific product development and marketing strategy, first developed in the sixties under the name of "Cannibalism". The term that originally stands for a gruesome occurrence in nature, whereby human or animal is eating one's own species, indicates in the realm of product development indicates an intriguing development strategy according to which an individual or a company appears to be competing against itself but actually is increasing its share of the market. This is usually done with the introduction of a new product which will become a substitute substitution for all related products in the market, including those that belong to the company who has launched it. In such scenario, the investment in research and development of the new product could return through better positioning of that company in the market.

The study explores potency of the concept of cannibalism within the realm of architecture and urban design as a strategy of spatial adaptability. The link between architectural research and practice is established through testing of such transposition in the real-life situation present in suburban environments. The concept of cannibalism is employed as a projective model for the gradual conversion of spatial conditions found at remote but well connected lots in the suburbs of many European cities. The chosen testing grounds are outlet parks and commercial zones most commonly situated alongside busy traffic routes. Practical dimension of the research is focused on the following questions: How to convert purely commercial and car dominated zones into the mixed-use environments by their very own creators? And what design methodology can foster such change?

This study probes if a design methodology could help mobilise large chain store owners, such as Ikea, OBI, Metro, Auchan, Decatlon, etc. to become partners in the enhancement of the built environment. It will investigate if the proposed design strategy might become a

framework for active involvement of large corporations which may recognise the opportunity to benefit from better use of their own assets and would team up with developers or housing groups (Fig. 1).

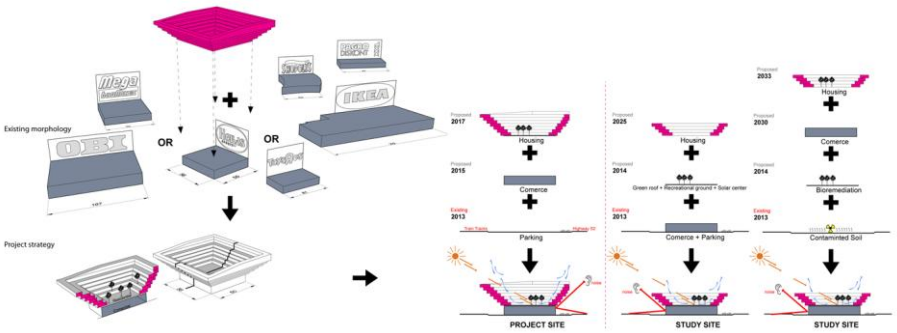


Fig. 1 The design framework.

The second part of the paper documents the case study and provides an account of the projective design model structured around the following set of intents: To maintain economically viable warehouses on the ground level as they are; to convert their roofs into green areas; to build a housing blocks of 5-6 stories on top of the commercial warehouses; to employ the built volume as a noise and pollution shield to protect the newly created micro-environment; and finally to create a range of housing units each dually oriented to benefit from the panoramic view of the vast landscapes of suburbia.

## 2. WHAT IS CANNIBALISM TO ARCHITECTURE AND URBAN DESIGN?

From a marketing perspective, "the theoretical roots of product cannibalism can be traced to the cross-elasticity of demand theory. This theory suggests that the percentage change in the price of product A demanded will be influenced by the percentage change in the price of product B. The demand interrelationship of the two products may then be described as independent, complementary, or substitutable. In the case of product substitution, or cannibalism, a lowering of the price on product A will tend to decrease the quantity demanded for product B and effect a leftward shift in the demand curve for product B" *[1]*. In more understandable terms, product cannibalism implies "introducing a new product designed to supersede and hence destroy its own current bestseller before a rival does. Particular attention is given to the payoffs of various superseding product strategies and, given these strategies, whether the leading firm can be expected to invest at least as much in innovation as a challenger *[2]*. Transposing the idea and the methodology of cannibalism form marketing to architectural and urban design, from one discipline to another, raises the following questions. What is the equivalent of "product" in architectural terms? And what is the correspondence for "product substitution" in terms of the built environment? Further argument in this paper is structured around a rather obvious assumption that architecture, as an integral part to building industry, produces buildings of different types and uses, and that "substitution," as referred to in product design, may imply change of typology and use of buildings. The idea necessitates close collaboration between developers, planners and architects. Similarly to the approach in product development, such strategy in development of built environment is geared to generate more revenue to investors and tease out new and more complex forms of buildings to suit the needs of their users. In an analogy with the product development method, where the need to innovate and invest in R&D sector is clearly recognized and directly related to success on the market, this study demonstrates one possible link between architectural research and practice and documents the development of the specific design strategy based on the theoretical model.

## 3. CASE STUDY

This chapter documents a case study comprised of the specific model development and its application within the concrete architectural proposal for the redevelopment of a suburban area. The study site is an Outlet Park located in the Viennese suburb of Kagran, at the wedge-like opening between two major lines of infrastructure that lead from and to the city of Vienna: the railway line on one side and the motorway on the other. The design brief put together by Europan organization (2013) states: "At the present, the study site is taken up by the enclave like Outlet Park, with the single use of commerce entirely dependent on the motorway. It houses a number of smaller retail and chain stores, but also a DIY megastore, two chain-stores for electronics and a large supermarket. In addition, an IKEA store and contaminated lot formerly used by oil refinery are both located just north of the study site. The spatial logic of the observed commercial area is that of a strip mall, with each shop as an independent unit and its own parking space spreading in front of it. Large, flat and low structures house a number of chain stores. All the shops are oriented towards a central thoroughfare comprised. The area is completely isolated and cut off from its surroundings by large pieces of infrastructure. Whereas the train line is irrelevant as a means of transport, the motorway directly leads into the area. Car mobility is the reason for the existence of the commercial areas and has up to now been the only way to get to and from the area. Pedestrian connections are weak because of large distances to surrounding neighbourhoods, especially since the area is accessible only from a few points. This isolation will be partly dissolved owing to the immediate construction of a new tramway line that will cross the study site. The ownership structure follows the same logic, with a different commercial tenant for each lot but with the one sole owner and the developer of the entire outlet park" *[3]*.

The proposed model for suburban redevelopment is tested through a specific design strategy applicable to the situation at Kagran. In an analogy with the methodology of Cannibalism in product development, whereby reduction of one product as a result of the introduction of a new product by the same producer, proposed architectural and urban design strategy stipulates reduction of the commercial warehouses at the account of new housing structures by the very same owner of the outlet park at Kagran. In terms of the built environment, the proposed strategy of Cannibalism is based on the spatial adaptability and on the model of gradual conversion of large outlet parks and purely commercial zones into the mixed use environments. Rather than the finite master plan, proposed intervention is structured as a set of nine actions (A to I) as indicated in the drawings (Fig 2).

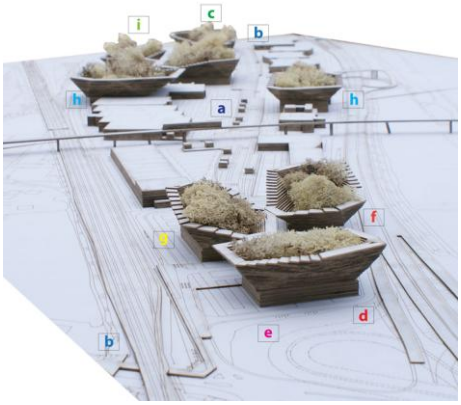


Fig. 2 Physical model showing adaptive development strategy through 9 steps.

The design intent is presented as a process of adaptation which takes place in a complex environment over the period of approximately thirty years. The first three steps are envisaged as an immediate improvement of the built environment plausible with the minimal

investment. The following steps are concerned with the actual implementation of the housing scheme. The concluding step considers the effect of the development on the immediate environment and transposition of the model to similar sites.

### 3.1 Initiating the process of redevelopment

The first step in the redevelopment process is a response to the existing conditions of the study site. Two of the most pressing questions are: How to begin conversion of parking lots and solely commercial areas into the setting suitable for housing? And how create a vibrant, pedestrian friendly and attractive environment? It is observed that a central thoroughfare has the potential to become the main channel of movement for cars, pedestrians and bicycles through the study area. Therefore, the very first step in the redevelopment process suggests provision of more amenities along this route. It is assumed that several existing stands, including those for fast food could be better designed to become an important feature along the route. Moreover, it is assumed that the kiosk morphology could be adapted to become an architectural solution which supports pedestrian movement and public life along this path. The insertion of a dozen or more of such kiosks with different uses is envisaged along the route. In the long process of the evolution of the existing Outlet Park into the mixed use environment, new shops and stands are proposed as the very first change. The rationale for their existence is based on the introduction of the public transportation. New kiosks could bring diverse amenities and greater choice of supplies and services to visitors and soon to be residents. Proposed intervention suggests that only a small number of parking spaces could be lost to amenities which could help create a more attractive environment for pedestrians.

### 3.2 Introducing pedestrian permeability

The next intervention is motivated by another frequent design question: How to connect a given site with the surrounding environment? The answer is based on the specifics of the study site. In addition to the new tram line, scheduled to open in the near future, which will provide for a quick and easy movement across the rail and the highway, the central thoroughfare is seen as a part of the pedestrian way leading in and out of the existing Outlet Park. The route is observed as a primary connection to the surrounding urban fabric to the West and recreational facilities the East of the given site. Although the route is stretching parallel with the highway and the rail, it is indentified as key to creating links to the surroundings, because it is connecting the only two established crossings over the highway and the rail. It is assumed that placing emphasis on the pedestrian and bicycle movement along this route could help integrate integration of the area which is currently cut off from the rail and the highway. It is also assumed that providing infrastructure for pedestrian circulation along this channel can help integration between different housing blocks constructed over the long period of time. This route is observed as the main pedestrian access from the new tram stop to the proposed housing development.

### 3.3 Initiating long-term decontamination process

The final of the three steps of the immediate improvement is related to environmental and ecological enhancement of the study site. This is triggered by the presence of an empty and oil contaminated lot in the northern part of the study site. It is understood that both time and financial resources are needed to unlock the potential of this zone. Assuming low and moderate level of presence of hydrocarbons and other man-made chemicals in the ground, since oil dumping has stopped several decades ago and strategy of polluted ground water management has already been put in place, this step of the redevelopment process proposes an intervention comprised of the removal of the thin surface layer of the soil and introduction of

plants and microbes which are capable of digesting hazardous materials over time in a process known as bioremediation. This could include introduction of willow trees and several species of crops, both known to be particularly effective in this respect. It is assumed that over a certain number of years or even decades, when toxic matters parish, this lot may become available for development. Until then, a newly created green zone could immediately contribute to better quality of the air and in the midterm it could become a park accessible to the increasing number of residents in the area. If decontamination processes prove to be successful, if after two decades of hard work, willow trees, crops and microorganism manage to decompose harmful chemicals in the soil, this area might open up as the new recreational grounds. In the more distant future, as there are plenty of recreational grounds located a single stop away by public transportation, this area could allow for further development and construction of several more mixed use housing blocks according to the model of Cannibalism.

### 3.4 Adding more commercial warehouses

The actual implementation of the housing scheme could begin in parallel with the decontamination of the northern part of the study site. Paradoxically, this step envisages extension of commercial facilities and continuation of what is now recognized as a profitable and well functioning exploitation of the site. Three new warehouses could be erected, mimicking the size and form of the buildings, already existing at the outlet park. Provision of the additional parking spaces and extension of the road system could be done simultaneously. Three new warehouses may be leased to individual stores or may be shared by several occupants. Such extension of the existing outlet park is foreseen as an integral part of the strategy of Cannibalism whereby a segment of commercial facilities will be gradually eaten away by other uses, namely housing. It is assumed that construction of the first housing block could start quickly, soon after introduction of small scale amenities, the emergence of pedestrian infrastructure and the initiation of environmental enhancement have started.

### 3.5 Introducing housing

Three newly planned warehouses are envisaged as three platforms from which further development can take place. The idea builds upon utopias developed in early sixties such as Isozaki's "Clusters in the Air" (1962) and Jonas' "Intrapolis" (1963). Half a century ago, both projects were deemed as utopias and were never considered to be financially viable solutions. According to the proposed model of Cannibalism, related ideas are reconsidered to provide an operative response to the context of the given site in Kagran. The proposed model enables an adaptive strategy of urbanisation through gradual insertion of housing into the purely commercial and car dominated zone. It stipulates the following: To maintain commercial warehouses on the ground level as they are; to convert their roofs into the green courtyards accessible only to the residents; to create a closed housing blocks of 5-6 stories on top of the commercial warehouses and thus create a noise-shield with the built volume to protect the internal courtyard; and finally to create a range of housing units each dually oriented to benefit from the panoramic view of the northern Vienna on one side and the access to the semi public space in the interior of the block on the other.

Each of the warehouses is linked to a single phase of the development, which could unfold simultaneously or sequentially. The proposed strategy anticipates involvement of at least three separate developers and construction of at least three large housing blocks.

### 3.6 Inhabiting the outlet park

The first residents could be moving into the first housing block only several years from the erection of the new warehouses. The second block could be nearing completion and construction of the third block could be well on the way by that time (Fig. 3).

Fig.3 Physical model studies showing three housing blocks.

The occurrence of the first residents in the former Outlet Park will generate more pedestrian traffic across the site and more small scale amenities could be erected on parking lots. By this time, on the other side of the study site, where contaminated land was, willow trees and crops could be starting to produce first but still invisible effects of the bioremediation. All three large housing blocks could be completed in the period not exceeding eight years. Construction noise could be finally over and residents could be settling in. According to the proposed model of Cannibalism, each housing block benefits form its own courtyard shared between its residents. At the same time, such structure provides another stretch of public space at the altitude of 22 meters above the ground level with an aim to establish internal connections between the three housing blocks. It is assumed that social ties could be developed at different levels and scales, such as: Between adjacent flats; among the residents whose apartments are sharing the same courtyard; and finally within the entire neighbourhood comprised of the three blocks. Leasing contracts for the warehouses at the ground level could come to an end in this period of time. According to the proposed model of Cannibalism, buildings erected as warehouses could now lend themselves to other uses. Together with the first level of the housing blocks, they could give room to necessary amenities including a school or a kindergarten.

### 3.7 Applying the model at the given site and beyond

If successful, a housing development at the project site could initiate further transformation of the entire Outlet Park. The construction of the housing blocks on top of the existing warehouses in the entire area could follow. As an example, after three housing blocks constructed above newly built warehouses, more housing blocks could be developed according to the same principles above the existing warehouses. The proposed model of Cannibalism anticipates active involvement of the large corporations who may recognise the opportunity to benefit from better use of their own assets, and will team up with developers or housing groups. The propped strategy anticipates that several commercial buildings on the given site could become platforms for the development of the housing blocks and that model of Cannibalism could be applied in other outlet parks.

## 4. CONCLUSION

This paper presents an application of the model of Cannibalism within the design methodology for suburban redevelopment. The model is transposed from the field of product development into architecture and urban design. The study demonstrates the link between architectural research and practice through testing of such transposition at the site specific situation characterised with some of the most common shortcomings of the suburban

environments, such as dominance of vehicular over pedestrian traffic and the lack of programmatic diversity. The proposed model offers a way to engage some of the large chain-store owners, such as Ikea, OBI, Metro, Auchan, Decatlon etc, in the development of suburbia and creation of the multifunctional environments. The presented strategy of cannibalism in architecture is based on spatial adaptability and implies physical change of the built environment over time. The proposed framework could allow for interactive collaboration between developers, planners, architects and users. Similarly to the approach in product development, the strategy of cannibalism in the development of built environment is observed in this paper as a mechanism to generate more revenue to investors and tease out new and more complex forms of buildings to suit the needs of their users.

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# RESEARCH THROUGH DIGITAL MAKING

**Daniela TĂNASE[1], Ionuț ANTON[2]**

[1, 2] *"Ion Mincu" University of Architecture and Urbanism (ROMANIA)*
*tanase.dana@gmail.com, ionut.anton@gmail.com*

**Abstract**

Addressing the digital fabrication domain in terms of implications for design practice transformation is still in its early state. These digital methods of design and fabrication are relatively new to the architecture practice, but are beginning to be explored. Most of these technologies are currently starting to be addressed, applied and developed, in the academic research [1].

Often the use of digital technologies has been interpreted as an excuse for obtaining forms without substance [2]. In these cases, the capacity of the fabrication technologies to achieve increasingly more complex geometries was the most valued. These approaches have been criticized as superficial, through the fact that this emphasizes the value of the technology itself.

Another approach was the one in which fabrication and digital design were seen as part of the theme of sustainability. The discourse on digital fabrication mainly focused on technical and economic aspects, while its implications beyond the field of engineering and industry were ignored. Thus they were interpreted as methods for achieving efficiency as a means to control the use of raw material supply.

However, a more profound approach on digital architecture practice, only recently started to emerge. The research in the digital domain transcends the new expression of architecture and its dependence on digital tools, and goes deeper into substance, in developing new ways in which we think and make architecture and design using digital tools. Current interest focuses on how the digital environment transforms the way we think about architecture. It also shows the design domain reorientation towards materializing architectural artefacts and in this context digital fabrication becomes part of the project.

This paper will focus on the way that digital design and fabrication tools can be embedded in practice through a research by design technique, using various methods of research. In this paper, the authors will present their own applications, which investigate the creative potential of several types of digital fabrication tools. The abilities of digital tools were tested through three methods: workshops with a given topic, but without a predefined result, design objects as a personal interpretation and robotic fabrication as an exploratory research for future applications.

**Keywords**: digital fabrication, creative digital tools, research by design

## 1 DIGITAL TOOLS IN RESEARCH

The digital technology proofs its utility, not only by designing and producing unique and custom objects, but, more important by offering possibilities that creatively can contribute to the design [3]. Thus the advantage that these digital tools provide is not the high-tech factor,

but the fact that are highly customizable for a variety of processes. The challenge for today's architects is they have yet to appropriate these foreign objects, migrated from different technologies, designed for other processes, and make them their own.

The evolution of Computer Aided Design software, from a mere use of a catalogue system of predefined elements to a more flexible system that allows users to customize the components that they use in the model and even to parametric adaptive systems leads the way to new architectural expressions specific to the digital environment. Thus the need to explore this new relation between the subjective characteristics of design and the objective aspects of digital tools emerges.

In order to use digital tools both for modelling and manufacturing, the design process overlaps different criteria, which are abstracted, and that relates: concept, performance factors, the material and methods of fabrication and assembly. This abstraction through code and algorithm has been interpreted as being responsible for excluding the intuitive design experience. This may be due to the fact that scripting was not until recently part of architectural design. Most of the times, scripting intervene in this creative area, as an exterior factor represented by a programmer. But, on one hand, to communicate, it is necessary that the designer to have code knowledge and on the other, the code should be influenced by aspects specific to the architecture practice [4]. Thus these tools considered rigid, if used by the one who create, by the architect, are charged with specific design attributes and become creative.

Using the digital logic, relations and intentions are defined as rules. Through programming, one can model complex decision-making processes of design, which are verified and refined iteratively. For this new way of conceiving architecture, processes are defining specific sequences of operations, procedures that must be designed. To explore the advantages of programming this work method must be integrated into the traditional design process.

In the attempt to adapt the digital means for the architecture practice, the programming software is being transformed and becomes focused on visual interaction, but remaining generic enough to allow different approaches. When it comes to design, the exception is often as important as the rule and hierarchical dependencies may change throughout the design process. Designers can intervene in this development of programming tools in order to create their own dialects that are tailored to construction topics, materials and space [5]. In this context, learning specific software is not what the architect goal should be, but adapting tools so as to be suitable for the architectural practice. Accessing these generic means allows architects to create individual design tools and, therefore, to make the process work. Thus they will be able to respond to the contemporary means and contemporary concepts by linking technology and the built environment.

Although the development of software is consistent, many times what results from the use of programming tools is not as original and the creative process does not seem to keep up with the pace of technological development. This lack of originality is visible by reaching similar solutions. The presence of an active community, which should lead to creative results, that are very different, seems to lead instead to focus in the same direction. By fostering an open-source environment seems to lead designers to combine scripts made by others, instead of using them as sources of inspiration, and to develop their own project-specific scripts [4]. It was noted that the same algorithm tends to be reused in several projects with minimal changes. This is due to the relative ease of generating slightly different solutions with minimal alterations of the same algorithm, but the artifacts generated tend to be similar. Creating a workflow that proves to be functional from concept to materialization is not easy to achieve, that is way it tends to be repeated. Most of the times is slightly modified for

different projects, for reasons of time and resource efficiency, and also to minimize the risks that comes with each new trial and in most cases error. Many designers or architects that use computational tools, they assumed similarity between their own projects as a specific trait that defines their personal style. Therefore, many times, we come to recognize the unique quality of the designer is only the result of repeating the same algorithm design and materialization. Thus the specific design practice creativity design becomes replaced the efficiency of computation.

## 2 IDZ RESEARCH PROJECTS

Our research is focused on a methodology of research through making, in which we explore new designs through digital tools, we fabricate them using digital fabrication tools and re-evaluate the design options. This is a highly iterative process based on a trial and error in which feedback is evolving the seed of the idea in a continuous process, each time driving the design one step further. The research starts from an emergent idea that embeds in an algorithm the creative process, the design options and the fabrication constraints. The algorithm evolves and most of the times the research is developed continuously and carried on through several projects.

We use different methods of research for different types of maturity of one idea. The emergent ideas are incubated for a long time until they are ready to be put to the test. The test is the workshop where other users interact with the algorithm and test its limits and usability. Sometimes the incubated algorithm is mature enough to be transformed into a design, and we use it to develop our own personal projects and derive full families of objects that are fabricated. With each fabricated object the process is reviewed and improved and the algorithm updated. The research for adaptability to a new shape, use or process sometime leads to a branching of the research and the development of a new family of objects and this becomes the main focus of another research project.

A different approach is employed with the exploratory work done with the use of industrial robots in the production of architectural artefacts and establishing a range of possibilities of uses for this kind of machines in the production of unique artefacts.

### 2.1 Workshops

The workshops that we organized were designed to provide professionals from the creative media with the opportunity to test the ability of digital tools in design and manufacturing. The fact that the workshops had as a result in physical objects digitally generated and produced, offered the opportunity to interweave the material aspects with the digital ones.

Both the developing of the workshop topic and the creative process during the workshop became a research method. Organizational issues related to the time management, access to materials and digital fabrication technologies imposed constraints that were addressed through the topic. This work method is specific to the architecture practice, which combines the objective logic with the creative thinking. Thus the theme research requires a period of documentation for the selection of the production process, the material, the project scale and especially for linking those together in a relevant subject for the design practice. During this phase the processes are projected and the problems anticipated, so the theme is constructed so as to exclude some of the possible difficulties.

Although the theme and the design and fabrication tools that are going to be used are clearly defined, the workshop outcome is not entirely predetermined. Using the provided tools, participants are given the opportunity to explore and to test their own vision, by creating

unique prototypes, as their own personal interpretations. The workshops are becoming a research by design process that test how new digital tools can be used in the architecture practice.

Participants interact with aspects of materialization and they understand that the digital environment does not provide automated tools that make it possible to achieve any form effectively. The whole process, from design to manufacture, has to be planned and abstracted by the designer.

The workshop as a working method proves itself to be a suitable means of knowledge transfer between primary researches, which we as tutors are achieving, to the community of architecture practice. Thus we develop and test the working methods and make them available to the community that can further apply and adapt them to their own practice. The aim is to show that these new work tools are affordable, customizable and that can foster the imagination.

### *2.1.1 COMPONENT_BUILD*

The concept of the workshop stars from the investigation of the principle that architecture is built through finite elements, such as a brick. And for the most of the cases and because a certain economy of construction all these elements that make up a building are all identical.

Today architects can work using construction components that are each unique and different, but a product of the same technological chain. Although, we deal with different elements they are at the same time similar. Architectural shape is no more constrained to serialism, but can incorporate a variability of the components, generating a differentiation at a global scale.

The workshop proposed to the attendees the development of projects starting form a parametric modelling of a single element that would then populate a surface. The aim was to achieve a global shape through local adaptation of the component geometry. Constraints of the fabrication and assembly processes are viewed as external factors influencing the component's geometry. The outline of the populated surface was generated by articulating the components, and the general shape integrity was maintained through the logic of aggregation.

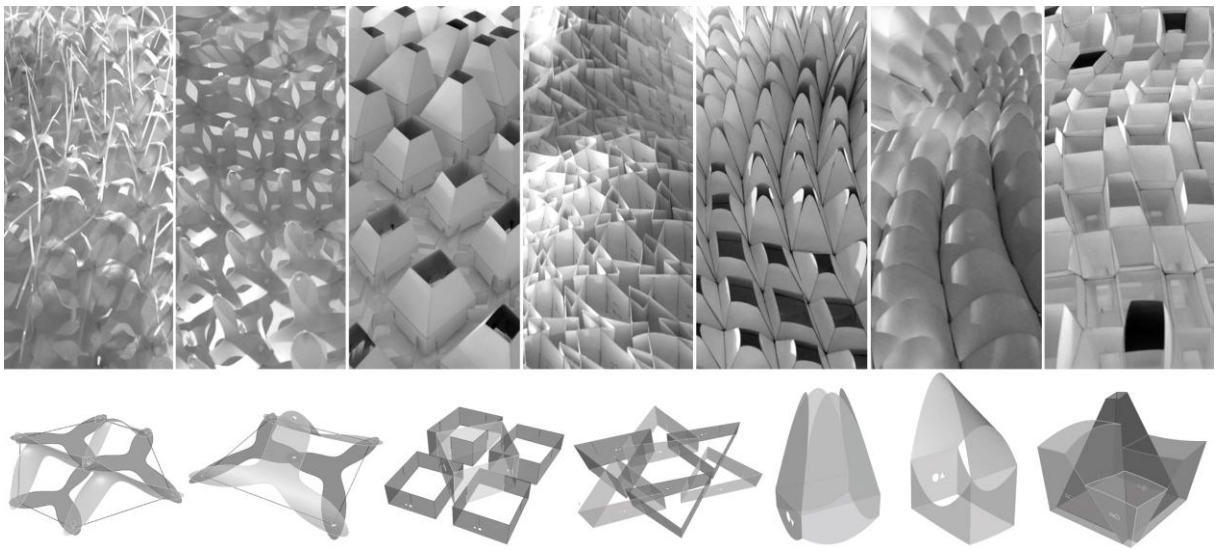

Fig. 1. Prototypes and components.

### *2.1.2 INformed_geometries*

The INformed_geometries workshop used digital form finding and generated geometries that were influenced by real data, performance analysis and physical forces simulation.

The current possibilities of the digital environment open up new paths to formal exploration of complex geometries that can be made real through advanced fabrication means. In the case of the INformed_geometries workshop one of the generators was the use of 3d printing technology that allows the production of small scale object with a high degree of complexity.

The models made as a result of the workshop are conceived as pertaining to an imagined world, and are the attendee's personal interpretation of architectural objects. The image proposed is willingly pushed to the limits of reality, being a manifestation of the capabilities of the digital tools, both as control of a geometry informed by real data, and as fabrication through 3d printing.

The aim of the workshop was to establish a connection between the virtual model and the reality of the context. The digital environment is used for performance analysis, for physical forces simulation, and for building a feedback loop of the results in the formal generation process. The output from the analysis and simulation is then used to optimize the geometry in an iterative process that offers a result that is directly affected by physical conditions. This is an informed result that responds to the performance criteria established by the generative algorithm.

The global shape is generated by the interaction of physical forces, interior and exterior to the system. The simulation establishes elastic relations between the underlying geometric components. The digital form finding process starts by defining the initial conditions and the initial geometry, what elements are fixed and what are the forces that act upon the model. After a dynamic relaxation process, the geometry is transformed through simulation and reaches an equilibrium state. The resulted shapes have their roots in the hanging chains or tensile structures, but are no longer a product of a physical modelling, but a result of a digital form finding process.

The overlaying of several performance criteria on the same geometry was possible through computation and the ability of the digital tools to communicate with various pieces of software used for structural or environmental performance. The information resulted from the analysis was directly implemented into parameters that influence differently each component of the geometry.

Fig. 2. 3D printed objects

## 2.2 Object Design

The making of the design objects by digital means intended to link computational design, digital fabrication methods and material. Digital tools were involved in the design practice in order to see how they can influence the creation and fabrication processes.

The research had two components: the first was related to the working method and the second addresses the final object, as the result of combining traditional design processes with digital tools. The creative process is based on the abstraction of design and fabrication process through code. It was also important to analyze the material outcome in order to observe what the digital influences on the final object were.

The work method is based on the feedback process between concept, fabrication and material. Thus the object is the result of a gradually evolving process, combining creativity with the attributes of digital tools. There is a continuous exchange where digital capabilities are subjectively interpreted; the creative process is transformed and the conceptual requirements are abstracted and translated into code. The purpose was not to obtain an entirely digital workflow but to relate, on the one hand, the intuitive design methods with the computational ones, and on the other hand, the digital fabrication processes with traditional manufacturing.

Although the conceived objects are small, the working process and the fabrication methods can be retrieved and used for an architectural scale. The research focuses on articulating components, on the interaction with the physical environment, through texture, aspects that also characterize the architecture practice. The fabrication tools is a domain that is currently under development and in time is aiming to be applied on a larger scale, for the construction of architectural components.

### *2.2.1 Digital_Silver*

Jewellery is a domain that involves working with precious materials, and requires precise modelling at a very small scale. This is a laborious process that depends on the highly trained professionals skills. Therefore the computational environment has become attractive for jewellers; there are already many 3D printers that print either wax molds or silver jewellery with a high resolution, but at a high cost.

The Digital_Silver jewellery collection explores how computational design and digital fabrication processes can transform the silver craft. The intention was to preserve a traditional process of casting silver, but to change the method by which the mold is obtained. Thus we used 3D printed models with a lower resolution and more affordable materials.

The fabrication comprised two stages; the first was the low-resolution 3D printing with ABS or PLA plastics, and the second the silver casting, which used as molds these 3d printed objects. Casting silver traditionally uses a wax mold, and then the negative is made, to be used for casting. Plaster is poured over the wax piece, and then inserted into an oven for the plaster to harden. In the furnace the wax is melting and after the plaster has hardened, the silver is pored during a centrifugation process to reach all points of the object.

By using these 3d printed objects as a mold, the layers are more prominent, and we tested how these affect the silver final object. Professional jewellery printers focus on the replication of the digital model, with very thin layers. In our process, the layers that remain visible on the resulted object and reveal the process by which it was made.

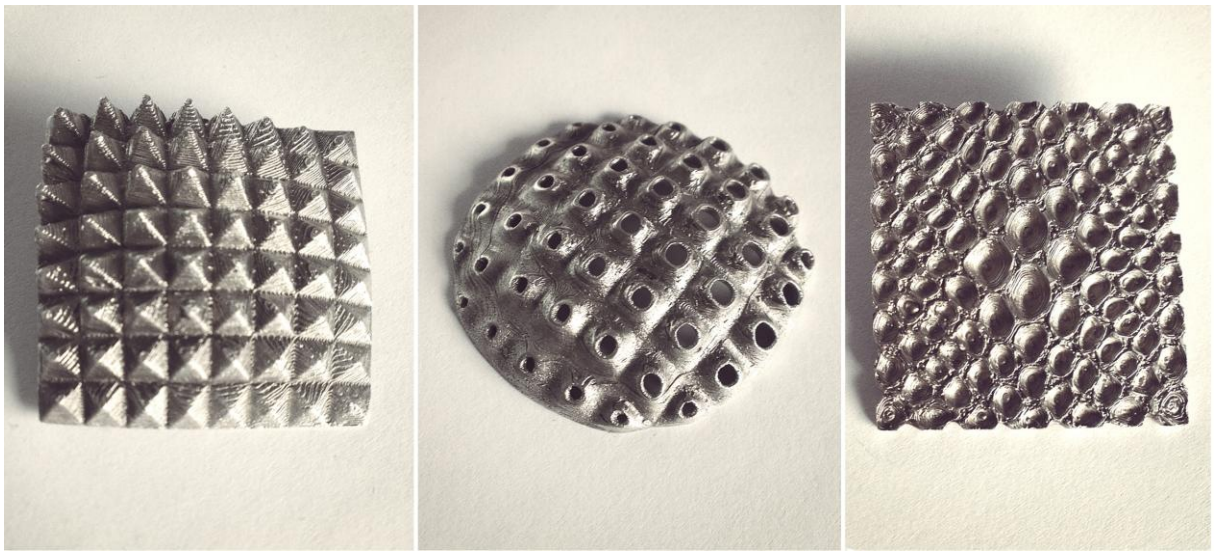

Fig. 3. Silver objects

### *2.2.2 Cell_Aggregation*

The intention was to discover generation methods that evolve from the surface subdivision, towards volumetric strategies, in this case cellar aggregation. The design process followed different methods of expressing these aggregation structures, exploring the relationship between negative and positive. This resulted in two very different versions based on the same principle of association, one expressing the cells continuous surface, and another that starts from cell edges resulting in a more porous forms.

Also, the project explored the cell geometry, which tests principles of deforming regular polyhedra, which lose their symmetry character, but keep their geometric relations. By deforming stable geometric structures we are obtaining an altered, but yet familiar image. In this design process the focus is on topological deformation and on relations between elements.

Fig. 4. The objects that explored two different fabrication methods. The firs series are laser cut and articulated by sewing the faces together. The second series are 3d printed. Both are interpretations of the sane cellular aggregation principle.

The design project explores means of articulating the cells in order to obtain heterogeneous structures that expressed the generation rules. The resulted objects oscillates between random and ordered, between massiveness and fluidity. Characteristics related to materiality

motivated the geometric transformations and are strongly influenced by the fabrication method.

The form finding process starts from the cell geometry, and has been an evolutionary process. Each cell is defined by the Voronoi diagram. That is a collection of points arranged in space, generating facets that negotiate their geometry as an average position of these points. Each side has one point that influences it. This algorithm has more complex results when combined with the principle of aggregation, and is applied to sets of cells which are tangent, or fill the space.

## 2.3 Robotic Fabrication

Our research also approaches a domain of some very versatile fabrication tools, the industrial robots. It follows the development of applications that focus on the increased degree of flexibility of these digital fabrication tools.

The research is exploratory in the sense that seeks new fabrication processes for using industrial robots. Robotic tools were just recently involved in the creative domain, thus references to robotic applications are relatively few, but in constant growing [6]. The interest for architecture in these tools is due to the fact that they are used for a large variety of applications.

Because they are machines with complex movements, usually on 6 axes, the interaction with robots was accessible only to those who have advanced programming knowledge. Recently more intuitive tools began to appear for visual mediation between three-dimensional space and robot code. Even so, to be able to adapt them to different processes, we need to know how they work, to understand the technical characteristics and the way to comunicate the information.

Their potential can not be achieved without a thorough understanding on the way they work. In the fabrication with industrial robots domain, the design becomes a complex process that integrates the robot movements, the definition on the end-effector and the geometry. Thus for each process, the end-effector design becomes one of the factors that customizes the production.

The applications developed using industrial robots are experiments that touch a field with numerous possibilities of use in the architecture practice. Their characteristic as versatile tools enables the designer's creative skills to involve them in architecture.

### *2.3.1 Robo_Craft wall*

Robo_Craft is a series of research projects that aim to explore the use of industrial robots in the creation and production of architectural artifacts. The research is focused on using an industrial robot ABB IRB 140 and testing its creative potential through various applications.

In other manufacturing processes, industrial robots are part of a highly rigid and automatic production chain. They perform the same repetitive task. Our intention is to make the robot perform a different task each time. We see in robots the potential for becoming highly customizable tools.

The first project in the series develops an application of robotic hot wire cutting of a parametric object formed by 81 volumetrically different components. Although the geometry of the components is different, once assembled the general form appears as continuous.

Using parametric systems, both for formal generation, and for fabrication, ROBO_CRAFT implements a full digital workflow from the form generation to the parametric control of the robot and the fabrication of each individual volumetric component.

For this first application we developed with the robot, we aimed at developing a simple architectural object, therefore we chose to build a vertical wall. In order to ensure the walls stability, without any additional supports, the wall follows a sine wave in plan.

The wall is made of volumetric components, based on the architectural principle of building with bricks; here the difference is given by the use of the robotic system that fabricates different bricks. The overall geometry expresses a variable but continuous transition, which results from the joining of the different components.

Trough this process we obtained a thick wall, with alternate perforations and with texture variations. The wall sides are differently addressed, due to the desire to explore two degrees of variability. On one side perforations have the same radius, the components are easily shifted, but with the same dimension, and the shape variability is given only by the surface geometry. On the other side the component's geometry is different depending on the overall shape, but also by varying the perforations radius and the surface texture.

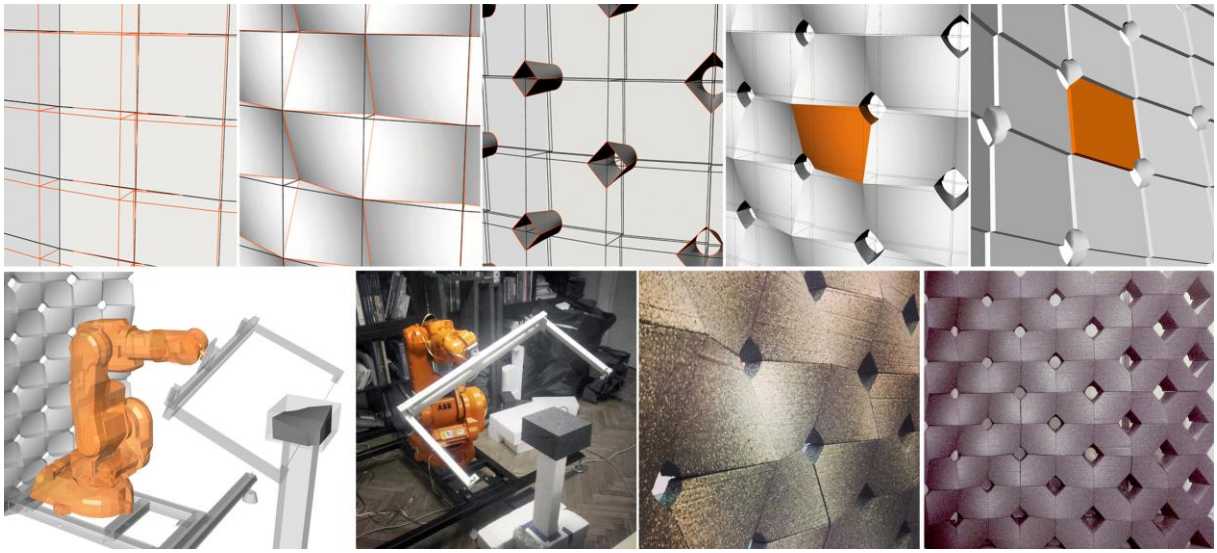

Fig. 5. The wall geometric construction, the robotic fabrication process, the final result.

### *2.3.2 Robo_Craft. Robotic Pixels Installation*

In our on-going research project Robo_Craft, we developed an interactive installation for the Connected. Things about Future, Cities and People / Exhibition. The general theme of the exhibition was to have a showcase of experiments that provide a link between technology and how it is used in connecting cities and people.

Technology helps us to interact, to connect with each other, to collaborate despite great physical distances between people. The connection thus created is most of the time one of a virtual nature. Robotic Pixels Installation aims to physically link four different cities through digital technology. Here the connection between places transcends the virtual environment and manifests physically with the help of an industrial robot.

The Robotic Pixels installation offers the opportunity to the inhabitants of the four cities to translate their physical presence in the exhibition space in Bucharest. The system is designed as a closed loop, activated by interaction with users. The process begins with translating the physical topography of the face into the virtual environment by means of 3d scanning. The information is passed through specific digital filters and abstracted to be processed by an industrial robot that will recompose the physical presence in Bucharest. The connection loop is closed by turning the visitor with active input in the process into a witness to the re-

materialization process. The robotic movements can be viewed in real-time as the three-dimensional image emerges.

Robotic Pixels explores how one can interact with industrial technologies that become sensitive. The robot is adapted and hacked to be used in a way that is creative and open to communication. Although the system integrates a multi-disciplinary technology, the focus is on active transformation and emotional connection. Robotic Pixels encourages a different communication experience, challenging the space-time relationship by means of simultaneous presence in many places.

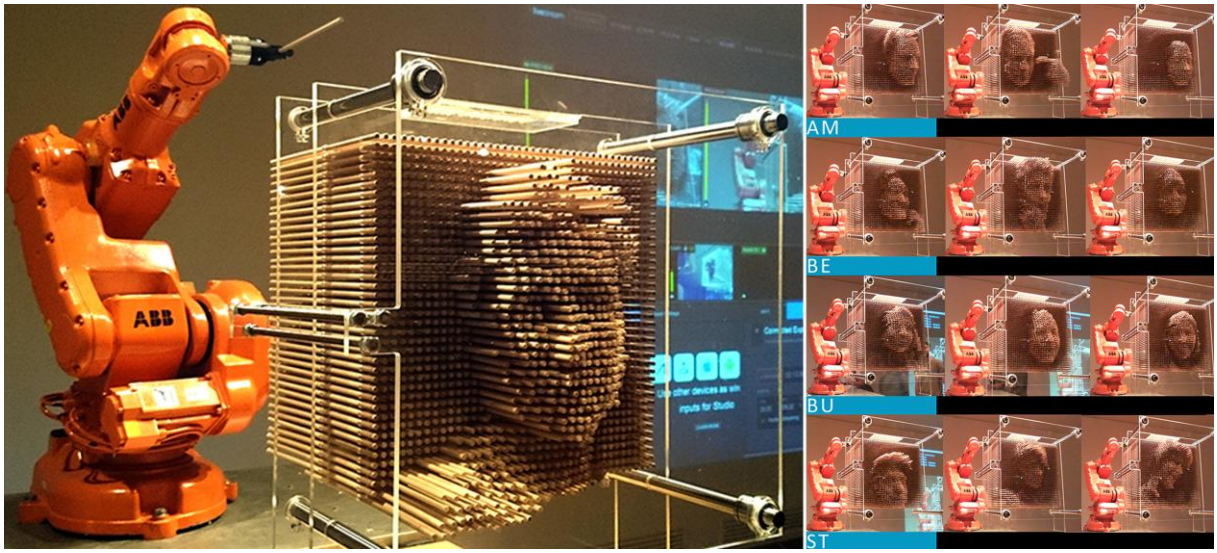


Fig. 6. Robotic Pixels Installation. Different portraits from all the four cities.

## 3 CONCLUSIONS

Although our research is focused on small scale objects or artistic productions, the methods involved and the workflows established can be adapted to a building or building component scale. The main advantage of the digital tools environment is their scalability and the flexibility to produce with a high performance and precisions objects at each scale.

By means of digital tools for design and fabrications, architects can shift the focus towards regaining the control in materialization of the architectural artefacts.

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