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Faculty of Science and Technology

Department of Architecture

Course Handout

History of Architecture 4

Specialty: Architecture

Level: 2nd year –Architecture-

Established by:

Dr. DJOUAD Fatima Zahra

2024 - 2025

Course Handout :

History of Architecture 4

Level: 2nd year Architecture

Subject information

Semestr 4

Teaching unit : EF4
Subject : History of architecture 4
Coefficient : 2
Eliminatory mark : Mark below 07/20

General aims of the teaching subject

The development of architecture has undergone an unprecedented acceleration. The rise of functionalism and modern architecture has gradually reoriented thinking towards the abandonment of academicism and a redefinition of the values of "beauty". The main objectives of the subject include:

- Understanding and analyzing the major shift that took place during this period, from aesthetic values, ornamentation, style and decoration to an architectural conception that prioritizes functionality and rationality, developing Sullivan's quote "Form Follows Function".
- The acquisition of the language specific to the modern movement and 20th-century architectural production (free plan, free facade, prefabrication, breaking up the box, etc.). Students must understand that the notions and concepts that revolve around architecture are the fruit of development over time. They must therefore grasp the history and chronology, as well as the interrelationships between all these concepts.
- It is also important to develop a critical appreciation of functionalist, modern and post-modern architecture as a social, cultural and political phenomenon. Students should be able to identify the positive points and negative impacts of these architectural productions on social and cultural aspects.
- Learn about the criticisms of modern architecture and the responses of post-modern architects. The latter sought to combine the formal innovations of modernity with a sensitivity to history and cultural context. Students will learn that architecture is constantly evolving, and that it responds to social, cultural and aesthetic issues that change over time.
- Make students aware of current issues and technical developments in architecture, with reference to the contribution of computer technology to architectural production: CAD, BIM, parametric design, artificial intelligence. We'll also look at the growing awareness of environmental impact, and the issues involved in energy management, HQE, sustainability

and more. Students will be encouraged to think about possible solutions for integrating these issues into their future practice as architects.

Teaching content

The modern movement in architecture

- Italian Futurism
- The Bauhaus school
- Cubism
- Russian Constructivism

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- De Stijl (Netherlands)

Le Corbusier

- The 5-point vision of modern architecture
- Urban vision (Cité Radieuse)
- Brutalism

CIAMs and the International Style

- The Athens Charter
- International style (works by Mies Van Der Rohe, Niemeyer, Neutra)
- Modern architecture around the world (Japan, Algeria, United States)

Post-modernism

- The work of Venturi
- Deconstructivism
- High-tech architecture, structuralism

Contemporary trends and current issues.

Evaluation method

Type of assessment Weighting in	% Examination
Exam	60
Continuous	40
Total	**100**

References & bibliographie

BENEVOLO, L. (1988), Histoire de l'architecture moderne, Tome 1 et 2, Paris, Dunod.

BENEVOLO, L. (1983), Histoire de la ville, Marseille, Éditions Parenthèses.
CHOAY, F. (1965), L'urbanisme, utopies et réalités, Paris, le Seuil.
CHOAY, F. (1991), La règle et le modèle : sur la théorie de l'architecture et de l'urbanisme, Paris, le Seuil.
COLQUHOUN, A. (2009), Collected Essays in Architectural Criticism, London, Black Dog Publ.
DAVEY, N. (1961), A History of Building Materials, Londres.
EVERS, B., THOENES, C. (2011), Théorie de l'architecture, de la renaissance à nos jours, Taschen, Cologne.
FRANCASTEL, P. (1988), Art et Technique aux XIXe et XXe siècles, Gallimard.
FRAMPTON, K. (1985), L'Architecture moderne, une histoire critique, Philippe Sers, Paris.
FRAMPTON, K. (1995), Studies in Tectonic Culture, Cambridge (Mass.), MIT Press.
FRAMPTON, K. (2002), Labour, Work and Architecture: Collected Essays on Architecture and Design, London-New York, Phaidon.
GIEDION, S. (2004), Espace, Temps, Architecture, Paris, Denoël.
HITCHCOK, H. R. (1995), L'Architecture du 19ème et du 20ème siècle, Pierre Mardaga.
JENCKS, C. (2005), The Iconic Building, the Power of Enigma, New York, Rizzoli.
KING, A. D. (2004), Spaces of Global Cultures: Architecture, Urbanism, Identity, London-New York, Routledge.
KOOLHAAS, R. (1978), New York Delire, Paris, Éditions du Chêne.
Etablissement : Département architecture,
Intitulé de la Formation : Architecte - Année universitaire : 2023/2024 Page 88
KOOLHAAS, R. (1995), S, M, L, XL, New York, The Monacelli Press, 1995.
LE CORBUSIER (2008), Vers une architecture, Flammarion.
MUMFORD, L. (1964), La cité à travers l'histoire, Paris, Seuil.
NORBERG-SCHULZ, C. (1988), Système logique de l'architecture, Pierre Mardaga.
NORBERG-SCHULZ, C. (2007), La signification dans l'architecture occidentale, Pierre Mardaga.
RAGON, M. (1977), Histoire mondiale de l'architecture et de l'urbanisme, 3 tomes, Casterman.
RAGON, M. (2000), L'homme et les villes, Albin Michel.
ROWE, C., KOETTER, F. (1993), Collage City, Paris, Centre Georges Pompidou.
SHARP, D. (1992), Encyclopédie illustrée des architectes et des architectures, Celiv.
ZEVI, B. (2015), Le langage moderne de l'architecture, Marseille, Parenthèses.

Summary

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Preface

This handout is intended for 2nd year architecture students. It presents all the courses required in the student's training in: History of Architecture 4, which aims to open his field of vision and thought to new issues around modern architecture and its revision, as well as contemporary trends and current issues.

The handout is divided into six chapters. The first is devoted to the acquisition of stylistic notions and architectural issues surrounding the modern movement. The second introduces Le Corbusier's new ideas, theories and founding projects. The third is devoted to modern urbanism through its two figures: the Charter of Athens and the International Style, concluding with a qualification and critique of modernist thought. The fourth course is reserved for the presentation of new architectural ideas and projects conceived by second-generation modernist architects. The fifth is devoted to the acquisition of stylistic notions around contemporary architecture, and the final course seeks to demonstrate the contribution of computer technology to architectural production: CAD, BIM, parametric design, artificial intelligence.

The main objective of the subject is to enable students to build up historical and theoretical references, and to use them in the development of their architectural project. This objective will be achieved through the following points:

- Understanding and analyzing the major shift that took place during this period, from aesthetic values, ornamentation, style and decoration to an architectural design that prioritizes functionality and rationality, developing Sullivan's quote “Form Follows Function”.
- The acquisition of the language specific to the modern movement and 20th-century architectural production (free plan, free facade, prefabrication, breaking up the box, etc.). Students must understand that the notions and concepts that revolve around architecture are the fruit of development over time. They must therefore grasp the history and chronology, as well as the interrelationships between all these concepts.
- It is also important to develop a critical appreciation of functionalist, modern and post-modern architecture as a social, cultural and political phenomenon. Students should be able to identify the positive points and negative impacts of these architectural productions on social and cultural aspects.

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Course I: The Modern Movement in Architecture

Introduction

After the Second World War, architects, artists and intellectuals will unite to establish a new order and change the world. The modern movement is an action born from the confrontation of progressive machine myths by rejecting any relationship with the past (Berdoulay, Claval, 2001) "of which Le Corbusier will be the herald and which will lead to the CIAM and the Athens charter." (Ragon, 2010, p232).

I.1. Italian futurism

This time it is the futuristic poetic school led by the Italian poet Filippo Tommaso Marinetti, who influenced architecture through rhythmicity and dynamics "inspired by speed" (Ragon, 2010, p77). The architect Antonio Sant'Elia reintroduced it in urban planning through his project La Citt Nuova through the implication of a very developed circulation by opening the door much more to metal structures (Ragon, 2010).

Figure 1.1: Citta Nuova, 1913.
Source: Mire Studeo.

The Italian Futurism movement is an artistic movement founded in Italy in 1909. It wipes the slate clean of tradition and advocates a new aesthetic based on progress, the speed machine. The Futurist movement is largely influenced by the radical transformations that

the urban passage knows at the beginning of the 20th century. Industries develop, the architecture of cities modernizes, new means of transport see the light of day: the car and the plane; until then little responded appear as new elements of an environment that will strongly influence the generation of the first Futurists.

Antonio Sant'Elia, a key figure in the Italian artistic world, was able to express the futuristic metropolitan myth in the most evocative way. Born in 1888, he attended the Municipal Technical Schools of Milan as a draftsman. Enrolled at the BRERA Academy in Milan in 1909, there he met the architect Mario Chiattone and the painters Carlo Carrà and Achille Funi.

Between May and June 1914 he participated in the Milanese exhibition of the "Nuove tendenze" group; there he presented plates on the "new city" (la cita nova 1913), six details of the city, an air-rail station, power stations and architectural sketches.

The projects of the architect San't Elia, were never realized San 't Elia had emphasized the formal qualities of modern architecture and also spoke of "the light of the practical, the transitory and the ephemeral" His drawings, of a deconcentrating modernity, will endorse and honor the aesthetics of the machine "the resistance of the materials allows the use of reinforced concrete and iron excluding classical or traditional architecture.

In the buildings of his city "the elevators must no longer be hidden but must be clearly visible on the facades...". The futuristic house must give the image of a gigantic machine, it will simply be a house of cement, iron and glass, without ornament. The argument of San't Elia is in accordance and even more intense than Marinetti's views on the machine.

None of the buildings in his famous drawings can be properly understood without ignoring the intensity of his opposition to the past. The content of his futuristic drawings is based on this conflict.

Behind the propaganda for machine aesthetics and the attacks on historical architecture lies an intense criticism of society. These vehement attacks were directed both against architects who still adhered to the precepts of academic architecture, as well as those of Art Nouveau.

Nevertheless, the extraordinary futuristic vision of the city of San't Elia would be realized a few decades later, thanks to his deep and notable influence. One of the projects, an integral

part of his new city, was a skyscraper, "la casa Grdinate" which was connected to a subway network, to elevators clearly visible on the outside of the building and to a circulation network built on different levels. The problem of circulatory traffic appears as an integral part of the architecture which is solved in a positive spirit.

Figure 1.2: Casa Grdinate.
Source: Nice Art Gallery

This project shows that San't Elia was greatly influenced by North American civilization, by certain rationalist and realistic aspects that had impressed

Adolf Loos, but also by the romanticism of his technical development and the expansion of an industrial metropolis.

The new city, or the city of the future, appeared to him as a reality that had to be realized in Italy too, a country that "was beginning to wake up from a long lethargy and come back to life" on its own initiative, San't Elia began to imagine that grandiose project that the "citta Nuova" would have been if it had been realized, from the general to the particular.

I.2. Cubism

Cubism was one of the great modern movements of the first quarter of the 20th century. Developed, under the influence of Cézanne, by Pablo Picasso and Georges Braque in the forefront, Cubism was constructed in a hermetic manner before interesting many painters, such as Juan Gris, Fernand Léger and Robert Delaunay. Cubism proposes a conceptual

deconstruction of reality, never abstract, but multiplying the points of view on the object. The subjects are often borrowed from everyday life. Several French painters, such as André Lhote, Jean Metzinger and Roger de la Fresnaye, practiced a Cubism linking academic tradition and modernity.

In 1913, four young Czech architects – Josef Chochol, Josef Gocar, Vlatislav Hofman and Pavel Janak – threw themselves into Cubism as one enters religion... Their approach is, above all, theoretical. Certainly, the works of their painter friends Filla or Kubista, who rushed into the breach opened by Braque and Picasso, are familiar to them.

Many projects were born from this intellectual reconquest, but very few were realized. For example, the building on Neklanova Street (1913) in Prague, where Chochol subtly weaves his facades by playing on identical or complementary motifs stacked like the pieces of a game of cubes; a house in Pelhrimov by Janak and the spa establishment in Bohdanec by Gocar (1911); the entrance gate and the two pavilions of the Dablice cemetery in Prague, whose conical roofs with broken zigzag steps testify to Hofman's explosive temperament...

Figure 1.3: The building on Neklanova Street
Source: www. Alamy.fr

Figure 1.4: A house in Pelhrimov by Janak
Source: www. wikipedia.fr

In its infancy in Bohemia, Cubism would ultimately be better represented through the work of the German architects of the “glass chain”, often called “crystalline”. Gathered around Bruno Taut, in the aftermath of the First World War, they asserted that the crystalline structure, linked to transparency, represented the natural order that commanded the

architect. The project for a monument in the shape of a crystal, placed on a spherical cap and dating from 1920, has the value of a manifesto and symbol. Taut's funeral monument in Stahndorf or the Berlin restaurant Scala by Belling and Würzbach bear witness to these progressive shifts of Cubism towards a more expressionist, chaotic asymmetry that generated tension and movement.

Figure 1.5: The Taut funerary monument in Stahndorf
Source: www.openeditionBooks.fr

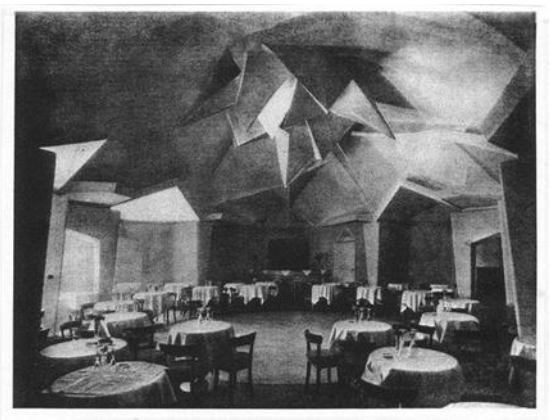

Figure 1.6: The Berlin restaurant Scala by Belling
Source: www. arthur.io. A Digital Museum.fr

The discovery of the properties and architectural plasticity of glass would accentuate a trend hailed in the United States by Hugh Ferriss, who celebrated these "crystal-like buildings," such as the Shelton Hotel in the Empire State Building. In the United States, Frank Lloyd Wright, although radically differentiating himself from the Czechs and Germans, also adopted a cubist approach, as with the Imperial Hotel in Tokyo (1915-1922) or the Arizona Biltmore Hotel in Phoenix (1927).

Figure 1.7: The Imperial Hotel in Tokyo
Source: www.gettyimages.fr

Figure 1.8: The Arizona Biltmore Hotel in Phoenix
Source :www.reddit.fr

I.3. Constructivism

Of the radical architectural movements that briefly flourished between the October Revolution and the period of imposed socialist realism in the 1920s, Constructivism has had the most lasting influence. Although largely abstract and deliberately non-referential, some examples of this movement reflect powerful forms, perhaps suggesting that crude but nevertheless idealized science could replace traditional Russian values and empty art of its spiritual content.

Constructivism is an extension of Russian futurism, angular forms inspired by Soviet industrial structures, and subjectivity are ideas, which fueled this style even outside the Soviet Union (Ragon, 2010).

Constructivism proceeded from two postulates: on the one hand, architecture could reflect and even give birth to the new Soviet society; on the other hand, biology and physics would provide it with a rational basis. Scientific processes were to generate new forms, and artistic tradition was therefore superfluous.

Constructivism originally found an outlet in ephemeral, controversial works of art, but its scope remained vast. Miliutin proposed an ideal form of the Soviet city, while others looked to social condensers, innovative buildings and institutions that would foster a new society. The powerful, angular forms of Melnikov's workers' clubs in Moscow are remarkable; inspired by the large-scale industrial structures that the Soviet Union was so keen to promote, these clubs gave workers' associations a monumental dimension.

Vladimir Tatlin's Monument to the International supports a slogan of constructivism, even though it never went beyond the project stage. Its aim is authentically Soviet and its form follows a logarithmic spiral, although it explicitly refers to the Eiffel Tower.

In its greatness in translating industrial products into abstract formal language, Constructivism belongs to the experimental movements of the early 1920s that form the building blocks of Modernism. It is also decidedly Russian in that it has its roots in the violent post-Revolutionary controversy over the role of art in expressing aspects of everyday life. Determining how a supposedly objective science can be translated into constructed form was inevitably a matter of subjectivity. Constructivism thus stood on the dangerous edge between functional design and subjective art, making it an easy target when subjectivity became politically suspect in the eyes of the Soviet regime.

Tatlin's famous tower, here reconstructed, captures both the structural dynamism and the ephemeral, almost fairground-like nature of early constructivist conceptions. Science and agitprop art were to combine to lead the people toward a new proletarian culture.

Figure 1.9: Tatlin's Tower
Source: www.alamy.fr

Figure 1.10: Eiffel Tower
Source: www.wikipedia.fr

I.4. Expressionism

More of a form of perseus than a defined movement, expressionism in architecture arose from the premise that a building could convey individual reflection without the mediation of conventions or architectural styles. After World War I, it provided a rallying point for what would become modern architecture.

The bold volumes required by industrial buildings and the lack of tradition in this field gave architects the freedom to experiment with spectacular forms for the first time from 1914 onwards. An early example was Hans Poelzig's extraordinary combination of a water tower and an exhibition hall in Poznan, Poland (1911). However, from 1918 onwards, many architects, especially in Germany, experimented with irregular forms and theatrical effects. These were often deliberately unbuildable projects, such as Mies van der Rohe's glass skyscrapers, but they aroused considerable controversy. The more realistic works of the Amsterdam School, particularly in the field of housing, displayed anthropomorphic forms. They participated in the expansion of the southern part of the city in the 1920s. Constructivism and functionalism shared the powerful and sometimes strange forms of expressionism, with some minor differences. Constructivism attempted to conceive of a new aesthetic based on the machine, while functionalism sought to match architectural forms with the functions assigned to them.

I.4.1. The Einstein Tower by Ench Mendelsohn, Potsdam (1917-1921)

Ench Mendelsohn's Einstein Tower in Potsdam (1917–21) brought Expressionism to its peak. It attempted to translate the physicist's famous formula into fluid architectural forms, as if forging a new relationship between space and time. Most Expressionists later settled down and moved toward functionalism or rationalism. Expressionism nevertheless provided a vital outlet for formal ideas at a time when all authorities and traditions seemed open to question. The hyper-modern design and sculptural lines of this astrophysical observatory embody the search for a relationship between new forms and new functions that was characteristic of the 1920s.

Figure 1.12: Sydney Opera House
Source: www.Sidney.Australia.fr in Potsdam

Figure 1.11: Ench Mendelsohn's Einstein Tower,
Source: www.tripadvisor.fr

I.4.2. Sidney Opera House, Sidney, Australia, JORN UTZON, 1956-1973

Utzon was one of the first architects to exploit the expressive potential of concrete shells, supported by the engineering expertise of Ove Arup and Partners. This building, with its resolutely original design, breathes freedom into an otherwise rather staid city.

I.5. Rationalism

There was no shortage of examples of architecture aimed at improving social conditions since the mid-nineteenth century, and whether new technology required new forms of architecture was an even older debate. However, the fusion of these two currents was brought about by the social disarray that swept across Europe at the end of the First World War. If this theory seemed attractive to the new regimes, in the Soviet Union as in Germany, it was because rationalism reasoned on a grand scale and placed planning above individual buildings, just as the collective should take precedence over the individual. Architecture seemed able to take advantage of scientific progress to lead to a new social order. It was in this context that the artistic movement of New Objectivity (Neue Sachlichkeit) was born, which, in reaction to Expressionism and its sentimental effusion, wanted to return to reality and the everyday.

Rationalism changed the concept of popular housing on a large scale, especially in Frankfurt and Berlin. Individual construction was often covered with only a thin layer of modernism, although Ernst May in Frankfurt and Gropius in his Weissenhör siedlung houses grappled with prefabrication and industrial production.

Figure 1.13: The houses of Weissenh of siedlung
Source: www.Architectural visits by Helena Ariza.fr

The basic forms of rationalism, the large openings and the blurring of traditional distinctions between façade and amer, inside and outside, became synonymous with modern architecture. To complete the transformation of rationalism from a practice of

intertwining social progress and industrial production to an aesthetic, Henry Russell Hitchcock and Philip Johnson had only to bring the images, without the underlying social program, back to the United States for their 1932 exhibition at the Museum of Modern Art (MoMA). The Deutscher Werkbund (German Craftsmen's Association) organized the design of the Weissenh of siedlung to demonstrate the potential of the New Architecture in the field of housing. It became a showcase for the simple, disciplined forms of rationalism. Coordinated by Mies van der Rohe, the result belied the heterogeneity of its design and presented a seemingly homogeneous construction.

The Bauhaus school of architecture and art, founded by Gropius in 1919, was originally located in Weimar. Political difficulties necessitated its relocation to Dessau, which allowed Gropius to design the new buildings. Their sunburst plan deliberately places all elevations on the same level and suggests dynamism, while the immense dimensions of the glass walls immortalize the industrial techniques used to build them.

Figure 1.14: Bauhaus
Source: www.minco.fr

After the Second World War, the model of large complexes spread throughout the world. This model innovated by Gropius represents residential districts arranged according to the principles of the functional city. It is a set of large geometric housing blocks with standardized materials, separated by common gardens, oriented towards the sun, including public services.

Figure 1. 15:The large sets.
Source :www.leparisien.fr/val-d-oise-95/les-grands-ensembles-au-cinema-du-symbole-de-la-modernite-a-celui-de-la-misere-18-11-2019- 8195571.php

I.6. Functionalism

Functionalists developed the theory that forms could be developed specifically to fit the functions they performed. Their ideas provided a supposedly objective basis for formal invention. Architecture, according to functionalism, responded to human needs, not to tradition.

Although the idea of form following function is rooted in the early modernist experiments of the 1920s, its origins go back much further. French architectural theorists of the Enlightenment challenged traditional faith in the superiority of classical forms, and Hegel, in his Aesthetics, argued that the origins of architecture must lie in the need to provide places for specific social activities or to fulfil a function. By the mid-19th century, how new functions might reinvigorate architecture was as hot a question as the role of materials, and was central to the teaching of the influential École des Beaux-Arts.

By the late 1920s, functionalism was inextricably associated with the free organic forms of architects such as Hugo Häring and Hans Scharoun, who saw buildings as tools for human activity. It was the introduction of this social dimension that led functionalism beyond expressionism, as its irregular and sometimes complicated forms put it in opposition to the supposed objectivity of rationalism.

Louis Sullivan, like his teacher Henry Hobson Richardson, studied architecture at the École des Beaux-Arts in Paris in the 1870s. Some of Richardson's own principles of composition influenced Sullivan, such as the smooth stone surface and the arched forms which are in fact elements of the neo-Romanesque style much appreciated by the latter. Le

Corbusier had an influence on Sullivan in the field of technical knowledge of tall buildings. "Form follows function" is the famous formula that Sullivan used in order to free himself from the academic architecture that was beginning to dominate at the end of the century and that came from Europe. It is also on this formula that Sullivan based his new theories specific to the new type of authentically American construction. It is worth noting that this short phrase will become a slogan for modern architects of the 20th century in an effort to radically rationalize architecture. These correspond to the three functions essentially fulfilled by any building of this kind. The ground floor and the first floor of a skyscraper are reserved for shops, banks and certain semi-public spaces. The current floors will have an identical function, essentially housing office spaces. The Facades will be treated according to a homogeneous representation. The top of the building will house the technical services, the facade of which will be designed differently from the rest of the building.

I.6.1. Philharmonic Theatre, Berlin, 1960-1963

Scharoun was one of the leading proponents of functionalism as the basis of modern architectural form in the 1920s. In this concert hall, his masterpiece, the design of the hall aims to optimize the acoustic quality and the line of sight from each seat, hence its overall shape and the seats at different levels on an irregular plan.

1.6.2. Town Hall, Seinäjoki, Finland, 1958-1960

Aalto stated that public and secular buildings of everyday use should be in a somewhat mysterious harmony, which underlines the symbolic and social aspect of his conception of functionalism. The open ground floor, the main hall emerging from the roof and the connection with his other works in the city centre support his vision of liberal humanism.

Figure 1. 16:The Philharmonic Theatre.
Source :www. wikepidia.fr.

Figure 1. 17: Town Hall, Seinäjoki.
Source: www.structurea.fr

I.7. Neoplasticist Decomposition of De Stijl

.The Dutch school of Hilversum developed neo-Wrightian buildings based on a strong dialogue between vertical and horizontal. But in the 1920s, the neo-plasticism of the De Stijl movement, with its geometric decompositions, developed by the painters Mondrian and Van Doesburg, had a great impact on architects. Gerit Rietveld, who was part of this movement, would build the Schröder house in 1924 according to these formal precepts. However, despite appearances, for economic reasons – of formwork – this building was largely made of traditional masonry, reinforced concrete being used only for the elements where it was essential. De Stijl gave a new meaning to the arts by bringing them together around the desire to destroy the figurative, and to use pure colours and shapes: the cube and the parallelepiped.

Figure 1.18: Schröder's house
Source: www.BnFpasserelles.fr

I.8. Organic architecture

The American architect Frank Lloyd Wight set out to rethink architecture, taking into account the possibilities offered by new materials, but also in relation to the contemporary way of life. In particular, he sought to reconsider the relationships between the individual, architecture and nature. Thus, he defined organic architecture based in part on a mystical conception of nature.

In the 1890s, American architecture was moving in a variety of directions. The Shingle style of the East Coast and the Bay style of California combined complex compositions and eclectic details with innovative interior design. In Chicago, however, architects were beginning to develop an entirely new architecture based on the steel frame, the elevator, and industrially produced ornaments. Louis Sullivan, one of the leading architects of this

trend, believed that in architecture, as in nature, form was derived from the essence of the task it served.

Figure 1.19: Shingle style of the coast
Source: www.wikepidia.fr

Figure 1.20: Bay Style (San Francisco Bay Style) in California
Source: www.123Rf.fr

I.8.1. The Usonian Houses

Frank Lloyd Wright went further than his lieber meister in seeking a unity between form and function, which he called organic architecture, a term referring to his love of nature. The strong horizontal lines of his early Prairie houses seem to tie them to the earth, and their innovative interior plans introduce new concepts of space and composition. The Usonian Houses (Usionan from United States of North America) of the 1930s were an attempt to make such architecture accessible to all Americans, at least to the greatest number. Even more complex in terms of space, but simpler in terms of construction to reduce costs, they were also linked to their site and the lifestyle of their clients.

- **The Robie House (1910): the little house on the Prairie**

In Chicago, the Robie House stretches out like a geometric abstraction. Considered the pinnacle of the Prairie style, this residence with its strong horizontal lines seems to embrace the horizon. Its overhanging roofs, like protective wings, cast their shadows on red brick walls, while inside, Wright orchestrates a symphony of fluid spaces. Each piece of furniture, each stained glass window harmonizes with its environment, supporting his vision of an authentic American architecture, free from European influences.

- **Greg Affleck's House (1941)**

Throughout his long career, Wright was associated with the quest for an authentically American architecture. In the 1930s, he explored simple, standardized construction methods to bring his architecture to a wider audience. Greg Affleck's house (1941) is one of the Usonian Houses that emerged from this approach. A subtle plan creates inventive effects of space, light, and texture.

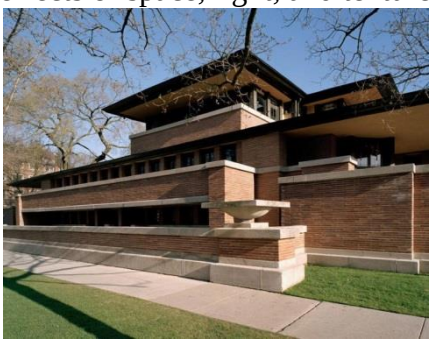

Figure 1.21: Robie house
Source :www.msn.fr

Figure 1.22: Greg Affleck's house
Source :www.FrankLloydwrightfondation.fr

I.8.2. The Imperial Hotel in Tokyo (1923)

In Tokyo, the Imperial Hotel witnessed an unexpected encounter between Wright's genius and Japanese aesthetics. A fusion of geometric patterns inspired by prints and a resolutely modern concrete structure, the building defied even the forces of nature by withstanding the great earthquake of 1923. Although the original has given way to a new construction, its spirit lives on in the Meiji-mura Museum, where carefully preserved fragments bear witness to a visionary architectural dialogue between East and West.

Figure 1.23: Imperial Hotel in Tokyo
Source :www.wikipedia.fr

1.8.3. Fallingwater (1935): the tamed waterfall (1935)

Nestled in the heart of the Pennsylvania forests, Fallingwater perfectly embodies Wright's genius. Like a natural extension of the rock, the house seems to spring from the waterfall it overlooks. Its bold, cantilevered terraces defy gravity, creating the illusion of a levitating building. The masterful use of local stone and raw concrete anchors the structure to its surroundings, while large bay windows blur the lines between indoors and outdoors. More than just a home, Fallingwater is an ode to nature, recognized in 2019 by its inscription on the UNESCO World Heritage List.

Figure 1.24: Fallingwater
Source: www.wikepidia.fr

I.8.4. Taliesin West (1937): an oasis in the desert

Set on a mountainside in Arizona, Taliesin West emerges like a mirage of stone and wood. Part winter home, part school of architecture, the complex is a tribute to the desert. Wright designed Taliesin West as a "desert utopia," consisting of low-rise buildings designed to reflect the vastness of the landscape. Using primarily local materials like desert rock and sand, Wright created a structure that seems to spring naturally from its surroundings. A living lesson in adaptation and harmony with the most extreme elements.

I.8.5. Johnson Wax Headquarters (1939): A Cathedral of Modern Work

In Racine, Wisconsin, Wright reinvented the workplace with the Johnson Wax headquarters. The open space, supported by elegant mushroom-shaped columns, became a secular cathedral dedicated to productivity and well-being. Light, filtered through thousands of Pyrex tubes, bathed the space in a soft, uniform brightness. In 1944, Wright completed his vision with the adjacent Research Tower, creating a complex that remains, to this day, a model of humanist corporate architecture.

Figure 1.25: Taliesin West
Source: www.travelhost.com

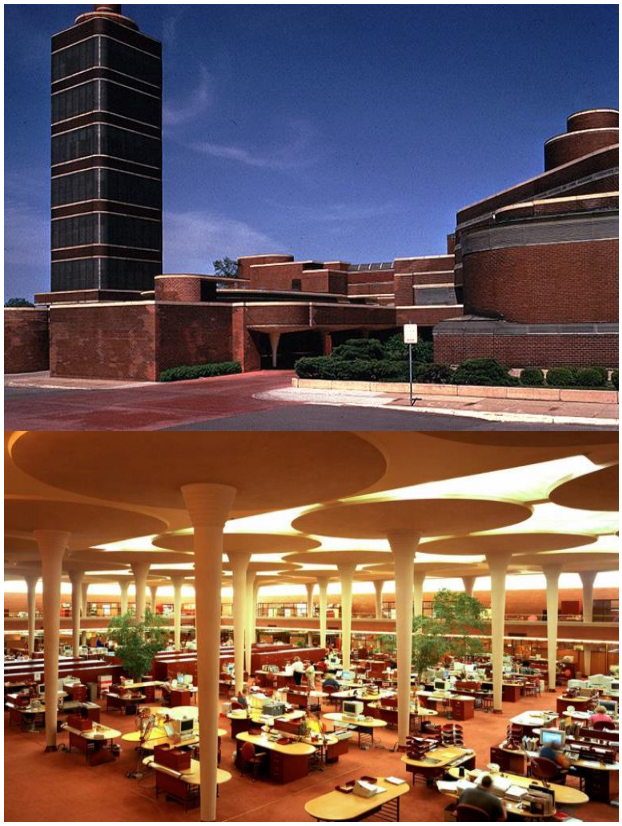

Figure 1.26: Johnson Wax headquarters
Source: www.wikiarquitectora.com

Conclusion

Within the framework of the modern movement, multiple architectural styles have appeared in the world: Italian Futurism with its urban utopias, Russian Constructivism with its structural dynamics, Expressionism with its artistic movements, Rationalism with its social vision, De Stijl with its pure colors and forms, Functionalism with its organic forms and Wright with his projects, agree in the rejection of the old.

References

Benevolo, L. (1988), History of modern architecture, Volumes 1 and 2, Paris, Dunod.

Benevolo, L. (1983), History of the city, Marseille, Éditions Parenthèses.

Blau, E. (2008). Urban planning and architecture of Central European cities during the first half of the 20th century. Perspective: 3 .https://doi.org/10.4000/perspective.3245.

Charre, A. (1983). Art and urban planning. Paris: PUF.

Choay, F. (1965). Urban planning, utopias and realities. Paris: Seuil.

Choay, F. (1991), The rule and the model: on the theory of architecture and urban planning, Paris, le Seuil.

Colquhoun, A. (2009), Collected Essays in Architectural Criticism, London, Black Dog Publ.

Davey, N. (1961), A History of Building Materials, London.

Evers, B., THOENES, C. (2011), Theory of Architecture from the Renaissance to the Present, Taschen, Cologne.

Frampton, K. (1985), Modern Architecture, a Critical History, Philippe Sers, Paris.

Frampton, K. (1995), Studies in Tectonic Culture, Cambridge (Mass.), MIT Press.

Frampton, K. (2002), Labour, Work and Architecture: Collected Essays on Architecture and Design, London-New York, Phaidon.

Jacqmin, Y. (2000). A century of architecture and urban planning: 1900-2000, Paris, Moniteur.

Koch, W. (1997). How to recognize styles in architecture, from ancient Greece to the 20th century. Munich, Solar.

Lavedan, P. (1993). History of urban planning in Paris. Paris: Joker.

Le Corbusier. (1992). Urban planning. Paris: EN Collection.

Le Corbusier. (1971). The Charter of Athens. Paris: Seuil.

Le Corbusier. (1966). Way of thinking about urban planning. Paris: Seuil.

Melivin, J. (2011). Discovering Architecture. Paris: Paperback.

Monnet, J. (2000). Urban planning in the Americas. Models of city and models of society. Paris: Karthala

.Pasket, D. (1930). Pages of American History: The Beginnings of the Canal and the Rail.Annals of Economic and Social History: 2(5). pp. 4-25.https://doi.org/10.3406/ahess.1930.1153

Patersan, JH (1990). American cities: aspects and issues. *Bulletin of the Geographical Society of Liège*: 26. pp 33-39.

Ragon, M. (2010). History of modern architecture and urban planning. Volume 3. Paris: Points.

Schittich, C. (2001). Glass architecture in the second half of the 20th century. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 34-58.

Seguim, Y. (2006) “Hiking in Quebec”, Ulysse, Montreal, Canada.

Siino, C., Laumiere, F., Leriche, F. (2004). Metropolitanization and large structuring equipment. Toulouse.

Stareb, G. (2001). From the origins to the modern movement. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 9-33.

Course II: Le Corbusier

Introduction

Architects were quick to react to the revolutions that took place in the world of plastic arts in Paris starting with Expressionism. The first results were nevertheless often eclectic and confused and the influence of specific currents is difficult to specify. But after the post-Cubist years, and under the major influence of Le Corbusier, modern art and architecture developed an aesthetic with obvious common points.

II.1. Purism

After an eclectic start to his career, influenced by Arts and Crafts, Charles-Edouard Jeanneret, known as Le Corbusier, completed his training at the art school of La Chaux-de-Fonds. Through travels in Europe, North Africa and the Balkans, becoming passionate about the most diverse forms of architecture. Painting and cubist art were the field of inspiration for Le Corbusier who wrote: "Today painting has preceded the other arts." (Ragon, 2010, p75). Purism is the evolved version of cubism: "neo-cubism" (Ragon, 2010, p75), influenced by this artistic school, Le Corbusier translates the three elements of this art: "matter, space and light" (Ragon, 2010, p74). Purism is a pictorial movement inspired by the functional aesthetics of machines which advocated the use of essential forms, established according to vertical planes, and the search for a structural balance in compositions.

Figure 2.1: Le Corbusier
Source:PA.fr

Figure 2.2: Purism Stock Illustrations
Source: Dreamtime.fr

Le Corbusier radically condemned existing movements while drawing inspiration from them. Like Cubism, purist painting presented objects in an unusual light but, instead of fragmenting them, emphasized their volumetric character. This underpinned Le Corbusier's definition that architecture is the learned, correct and magnificent play of volumes assembled under light.

II.1.1. The five points of modern architecture

In the 1920s he developed an aesthetic, forever linked to modernism, of elongated white forms that seemed to float in space, born of an understanding of technology as much as art. New methods of construction, he argued, severed the relationship between structure and cladding and allowed buildings to be raised above the ground. Roof terraces created a new relationship between nature and building, while horizontal glass windows offered a completely different frame to the vision than conventional fenestration.

1. The stilts: The architect uses stilts a lot, in the project of the radiant city of Marseille is the example, it is mounted on these concrete pillars while only the water of the tiny artificial lake risks flooding.

2. The roof terrace: The roof terrace, the roof is a part that is still little used today for installations, the artist uses it fully to incorporate: swimming pools, athletics field, daycare and other terraces and "barbecue corners".

3. The free plan: With the appearance of reinforced concrete, Le Corbusier imagines a new concept, removing the load-bearing walls to have a free plan. His design, the domino, is the very example of these new possibilities, and is certainly the most important point of Le Corbusier's architecture.

4. The ribbon window: The artist said at a conference: "The materials of urban planning are the sun, space, trees, steel and reinforced concrete, in this order and in this hierarchy." The best illustration of these words is these famous ribbon windows of enormous bay window letting in sunlight for perfect brightness and to always achieve well-being.

5. The Free Facade: Thanks to the free plan, the facades are no longer load-bearing, which allows these large walls to be replaced by windows, for example.

At this stage in his career, Le Corbusier shared the rationalists' belief that industrial production would refine objects to their essential forms and thus make them the key

constituents of architectural design. His designs continued to evolve, however, and from the 1930s onwards his work acquired an increasing simplicity while retaining his keen sense of form.

II.1.2. Villa Savoye, Poissy, France, (1929-1931)

The machine for living in, such was Le Corbusier's definition of the house in the 1920s and this plan sums up many of his ideas of the time. The purist aesthetic of this house is revealed in the subtly arranged elements, the pilotis, the long windows, the roof garden.

Figure 2.3: Savoye house.
Source: www.Wikipedia.fr

II.2. Rationalist urban planning

Le Corbusier's reflection on the city can be seen through his written and projected works. It developed in three periods:

- From 1910 to 1915: writing the study Construction of Cities.
- From 1914 to 1925: nine planned projects for workers' cities / garden cities
- From 1922 to 1925: the texts published in his theoretical work “Urbanism”.

II.2.1. Some theoretical works of Le Corbusier

- Towards an architecture in 1923: In this book Le Corbusier seeks to discuss the reality of architectural production, and its identity in relation to its time, by refusing to apply the principles of inherited styles which are qualified, according to him, by "the old-fashioned".

- Urban planning in 1925: Le Corbusier's thinking is set out in this book, which reveals his guiding ideas in terms of urban planning.(Le Corbusier, 1992).

- The Athens Charter in 1933: In this document, we notice the great influence of Le Corbusier which is reflected in his principles of modern urban planning.(Le Corbusier, 1971).

- When the Cathedrals Were White in 1937: Le Corbusier visited America in 1935, he was impressed, by the American city. As a result he tried to draw lessons for his radiant city.

Figure 2.4: Le Corbusier's books.
Source: https://www.bukowskis.com/en/auctions/570/664-le-corbusier-collection-de-l-esprit-nouveau-5-vol

II.2.2. Some of Le Corbusier's projects

- *The planned projects*

-For a contemporary city of 3 million inhabitants in 1922: On flat land, Le Corbusier imagines a center made up of 24 60-story skyscrapers, and developed with large green areas.

It gives great importance to the street and its use. Three types of streets on floors:

- in the basement: heavy goods vehicles
- at the ground floor level of buildings: normal streets.
- North-South-East-West: the two axes of the city.

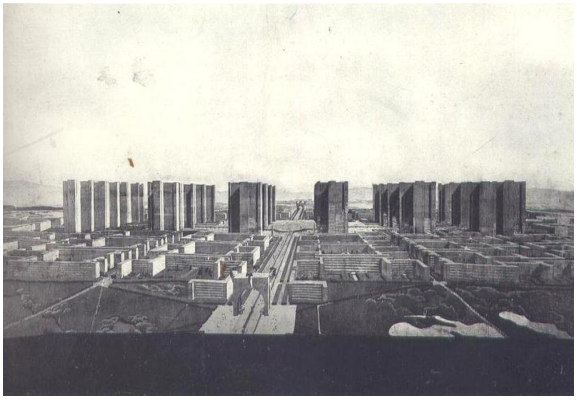

Figure 2.5: For a contemporary city of 3 million inhabitants.
Source :http://lardpourlard.canalblog.com/albums/recherches__influences__critiques__interets/photos/45529708-le_corbusier__a_contemporary_city_of_3_million_inhabitants_.html

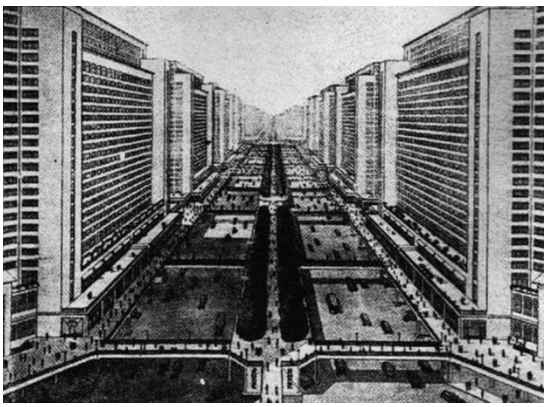

Figure 2.6:The street in the contemporary city of 3 million inhabitants.

Source :https://www.pinterest.fr/pin/383580093247517356/

-Plan near Paris in 1925: Le Corbusier chose the center of the city of Paris, facing the Ile de France, as his imaginary site to build his 18 200m high towers, intended for business.

Figure 2.7:The neighboring plan of Paris.
Source: Plan voisin de Paris.

-Le Corbusier and the plan of Algiers: From his study of the center of Algiers, Le Corbusier proposed his development plan based essentially on "a segregative character by accentuating the colonial dualism common to all the cities of Algeria. His projects did not come to fruition."

- *Projects carried out*

-The Radiant City in 1945: In a single housing unit, Le Corbusier integrated the multiple functions and collective services. In 1946, he began "the Radiant City", as he liked to call it, a building in the suburbs of Marseille that would undoubtedly become the most influential architectural example in the post-war years. It is the "housing unit of conforming grandeur" completed in 1952. Built in Marseille, it is intended to house a

community of one thousand six hundred people. Its three hundred and thirty apartments consist of a living room that opens onto smaller rooms that are reached by an internal staircase. By adding a gym on the roof, and sculpted chimneys to evacuate heating fumes and cooking vapors.The housing unit: Bringing together the components of a city in a single volume "the radiant city" A revolution in urban planning in France in the 1950s. In a single volume "the radiant city" brings together all the components of a city with its local services, its leisure and convivial spaces.

-The garden city of Pessac between 1924 and 1926: This city marked a revolution in its time in the planning and design of inhabited space.

Figure 2.8: Radiant city.
Source :https://www.lemoniteur.fr/article/les-habitants-de-la-cite-radieuse-feue-prennent-la-parole.1213764

Figure 2.9: Garden city of Pessac.
Source :http://www.fondationlecorbusier.fr/

-The Chandigarh Master Plan: In Chandigarh, Le Corbusier was in charge of the city's master plan, he led the team of architects in designing the three main government buildings: the Palace of Justice (1955), the Secretariat (1958), which is the seat of the ministries, and the Parliament (1962).

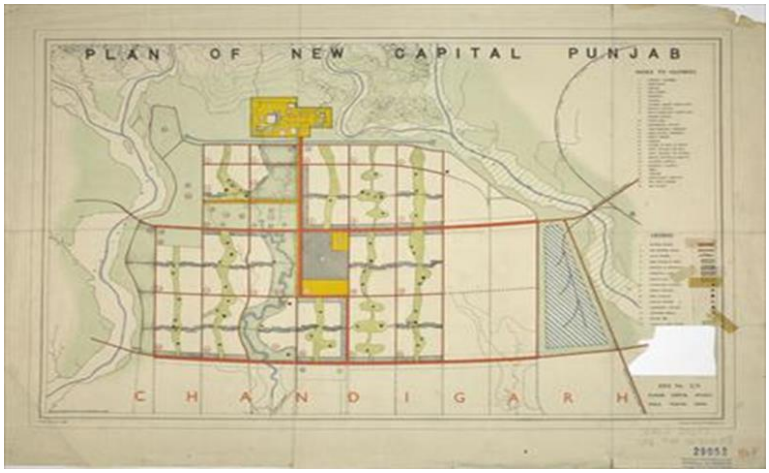

Figure 2.10: Master Plan of Chandigarh.
Source :http://www.fondationlecorbusier.fr/corbuweb/morpheus.aspx?sysId=13&IrisObjectId=6286&sysLanguage=enen&itemPos=174&itemCount=215&sysParentId=65&sysParentName=

The most significant feature of Chandigarh is its capitol, formed by a group of four buildings the palace, the administration, the assembly and the supreme court, designed on an enormous scale. The combination of spatial complexity and the roughness of its texture, in a conceptually and technically possible way.

II.3. Brutalism

Although the term has been applied to any form of unpopular post-war architecture, Brutalism has more specific origins. In 1954, the term New Brutalism was first used to refer to a group of British architects surrounding Peter and Alison Smithson; it characterised their fascination with the raw expression of materials, forms and functions.

The large-scale public works programme undertaken in England in the immediate post-war period quickly embraced modernism, but due to shortages of materials and a lack of knowledge, the designs were often modernist in name only. Inspired both by the innovative analyses of the German art historian Rudolf Wittkower and the apparent rigour of the new works of Le Corbusier and Mies van der Rohe, young architects sought a more credible intellectual basis for their work. They found it by grafting a radical application of the old doctrine of honesty about materials onto the forms developed by Mies van der Rohe in the campus of the Illinois Institute of Technology (1939–56). The Hunstanton School in Norfolk deliberately exposes the whole of its structure, materials and services with extraordinary clarity.

Figure 2.11: Hunstanton SchoolSource:https://www.google.co.in/url?sa=i&url=https%3A%2F%2Fc20society.org.uk%2F100-buildings%2F1954-smithdon-high-school

The movement's chronicler Reyner Banham argued that Brutalism was more ethical than aesthetic. It consciously sought to create an architecture that stood outside tradition and conventional canons of taste and created its effects through stripped-down materials and uncompromising forms that were supposed to flow from function.

After Le Corbusier, concrete was to be used in its raw state. Any form of covering, including weather protection, was considered immoral, which lent an emotional charge to the polemical debates. It is hard to ignore the aesthetic effect of the window arrangement in Peter and Alison Smithson's Sugden House or the elegance of the detailing of the Economist Building in London, but their creators maintained that these effects were the result of the logical arrangement of ordinary objects, not the pursuit of a particular aesthetic.

Brutalism had parallels outside Britain, notably in the United States, with Paul Rudolph's use of striated concrete. In Sweden, in the 1950s, Sigurd Lewerenz marked his return to architecture after a thirty-year absence, abandoning his earlier, boldly neoclassical idiom for materials and forms that were raw but never crude.

Figure 2.12: Sugden House
Source: www.Alamy.fr

Figure 2.13: A building by Paul Rudolph
Source: Associations des Sites Le Corbusier.com

Figure 2.14: Markuskyrkan.
Source: Facebook.com

Figure 2.15: Sainte-Marie-de-la-Tourette Convent
Source: Associations of Le Corbusier.com Sites

- **Convent of Sainte-Marie-de-la-Tourette, Eveux-sur-P'Artiresle, 1957-1960**

In this work, Le Corbusier explored the potential of raw concrete in creating various textures, shapes and lighting conditions. In this, he was close to the thinking of brutalism that its defenders preferred to consider as an ethic rather than an aesthetic. The façade visible from afar seems to spring from the mountain, with its glass roofs with irregular spaces between its bays… As was his habit, Le Corbusier did not want to "disguise" his work by applying coatings. He left the raw concrete, with its grain and the traces of the formwork.

Conclusion

From purism to brutalism, Le Corbusier presented a reorientation in his architectural thinking while always keeping a link with nature. On an urban scale he consolidated the progressive vision with new designs based on a modernity inspired by industry and cubism.

References

Benevolo, L. (1988), History of modern architecture, Volumes 1 and 2, Paris, Dunod.

Benevolo, L. (1983), History of the city, Marseille, Éditions Parenthèses.

Blau, E. (2008). Urban planning and architecture of Central European cities during the first half of the 20th century. Perspective: 3 .https://doi.org/10.4000/perspective.3245.

Charre, A. (1983). Art and urban planning. Paris: PUF.

Choay, F. (1965). Urban planning, utopias and realities. Paris: Seuil.

Choay, F. (1991), The rule and the model: on the theory of architecture and urban planning, Paris, le Seuil.

Colquhoun, A. (2009), Collected Essays in Architectural Criticism, London, Black Dog Publ.

Davey, N. (1961), A History of Building Materials, London.

Djouad, F.Z. (2021), Introduction à l'urbanisme, Université de Guelma, Algérie.

Evers, B., THOENES, C. (2011), Theory of Architecture from the Renaissance to the Present, Taschen, Cologne.

Frampton, K. (1985), Modern Architecture, a Critical History, Philippe Sers, Paris.

Frampton, K. (1995), Studies in Tectonic Culture, Cambridge (Mass.), MIT Press.

Frampton, K. (2002), Labour, Work and Architecture: Collected Essays on Architecture and Design, London-New York, Phaidon.

Jacqmin, Y. (2000). A century of architecture and urban planning: 1900-2000, Paris, Moniteur.

Koch, W. (1997). How to recognize styles in architecture, from ancient Greece to the 20th century. Munich, Solar.

Lavedan, P. (1993). History of urban planning in Paris. Paris: Joker.

Le Corbusier. (1992). Urban planning. Paris: EN Collection.

Le Corbusier. (1971). The Charter of Athens. Paris: Seuil.

Le Corbusier. (1966). Way of thinking about urban planning. Paris: Seuil.

Melivin, J. (2011). Discovering Architecture. Paris: Paperback.

Monnet, J. (2000). Urban planning in the Americas. Models of city and models of society. Paris: Karthala

.Pasket, D. (1930). Pages of American History: The Beginnings of the Canal and the Rail.Annals of Economic and Social History: 2(5). pp. 4-25.https://doi.org/10.3406/ahess.1930.1153

Patersan, JH (1990). American cities: aspects and issues. *Bulletin of the Geographical Society of Liège*: 26. pp 33-39.

Ragon, M. (2010). History of modern architecture and urban planning. Volume 3. Paris: Points.

Schittich, C. (2001). Glass architecture in the second half of the 20th century. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 34-58.

Seguim, Y. (2006) "Hiking in Quebec", Ulysse, Montreal, Canada.

Siino, C., Laumiere, F., Leriche, F. (2004). Metropolitanization and large structuring equipment. Toulouse.

Stareb, G. (2001). From the origins to the modern movement. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 9-33.

Course III: International Congresses of Modern Architecture and the International Style

Introduction

The main objective of the International Congresses of Modern Architecture (CIAM) is to establish the modernist ideology in architecture and urban planning throughout the world, generating the "international style".

III.1. International congresses of modern architecture

III.1.1. CIAM I: The Sarraz declaration in 1928

The idea of the CIAM foundation belonged to Hélène Mondrot, who managed to bring together all the "creative minds" in her castle in La Sarraz, Switzerland. This idea was translated into a specific project after consultations with Siegried Giédéon and Le Corbusier. A preparatory document was drawn up with the aim of establishing an action programme aimed at pulling architecture out of the "academic impasse" and situating it in its own social and economic context. The realisation of this programme required the following means:

1. The concept of modern architecture involves the connection of the architectural phenomenon to that of the general economy.

2. The notion of "yield" does not imply production providing maximum commercial profit, but production requiring minimum work effort.

3. The need for the most efficient output is the inevitable consequence of the impoverished regime of the general economy.

4. The most efficient production results from rationalization and standardization. Rationalization and standardization act directly on working methods both in modern architecture (design) and in the construction industry (implementation). Rationalization

and standardization act directly on working methods both in modern architecture (design) and in the construction industry (implementation).

5. Rationalization and standardization react in three ways: They demand from the architect designs leading to a simplification of working methods on the building site and in the factory. For construction companies, they mean the drafting of trades; they lead to the employment of a less specialized workforce, supervised by elements of high technical capacity. They expect from the consumer (i.e. the one who orders the house or who lives in it) a revision of the requirements in the sense of a readjustment to the new conditions of social life. Such a readjustment will be manifested by the production of certain individual needs now without real reasons, and the benefit of these reductions will favor the satisfaction as broad as possible of the currently compressed needs of the greatest number.

III.1.2. CIAM II: Housing at Low Rent "HLM", 1929

Dominated by the Germans of socialist tendency, This congress which was held in Frankfurt will be devoted to the theme of "low-rent housing", it is considered as the real beginning of the CIAM The debates around the questions of maximum heights and spacing between housing blocks for a rational use of land as well as materials. The points treated in this CIAM are

- Establish the problem of contemporary architecture.
- Restore the idea of modern architecture.
- Extend this idea to all technical, economic and social areas of contemporary life.
- Being aware of the problems of architecture.

Figure 3.1: HLM
Source: www.wikipedia.fr

III.1.3. CIAM III: Rational methods for the construction of housing groups, 1930

The crucial question was whether to remain within the tradition of the single-family house, whether to build buildings in spaced rows as Gropius proposed, or whether to opt for multi-storey residential towers as in Le Corbusier's "contemporary city".

By 1930 it was becoming apparent that the CIAMs were not really prepared, either intellectually or organizationally, to deal with the problem to which the logic of the discussions had led, namely urban planning.

To address this situation, CIAM began working on "the standardization of graphic techniques, scales and graphic representation techniques" used by its members, although this was only achieved after the adoption of the "CIAM Grid" after 1949.

III.1.4. CIAM IV: The functional city or The “Athens Charter”, 1933.

This new congress was to have as its theme: "The Functional City", which was to take place in July and August 1933 on a ship, the "Patris", during a cruise between Marseille and Athens. It was one of the first congresses where the ideas on urban planning of Le Corbusier and the French group had dominated rather than the German realists.

The Athens Charter in 1933: In this document, the great influence of Le Corbusier is noted, which is reflected in his principles of modern urban planning (Le Corbusier, 1971). The 101 proposals contained in the Athens Charter consist of resolutions concerning the conditions of existing cities, following a comparative study of 34 European cities, and others on the improvement of these conditions, grouped under four priorities: Housing, recreation, work, transport, in addition to a fifth recommendation concerning the conservation of historic buildings.

- **The principles of modern European urban planning**

It is based on the clear separation between the functions of the city (zoning):

-Living: Housing is the initial core of modern urban planning, it must be extended outside by various community facilities, by common services intended to provide supplies with ease (Le Corbusier, 1971).

-Work: Commercial activities can be integrated into residential buildings. On the other hand, industry must be isolated in another area.

- Cultivate body and mind: Schedule public green spaces and sports areas to relax and relieve urban stress.

-Circulate: From Construction of cities to Urbanism, Le Corbusier moves from the street perceived as a place of understanding the city to the street conceived as a machine for

circulating (Le Corbusier, 1966). He proposes a typology for the street and its use in the form of a rule: "the rule of 7V":

- The national road.
- The municipal road.
- Lanes reserved for mechanical traffic only.
- The shopping street.
- The roads leading to the doors of the houses take them.
- The paths leading pedestrians to the doors of the houses.
- The roads serving the green area of the sports facilities.

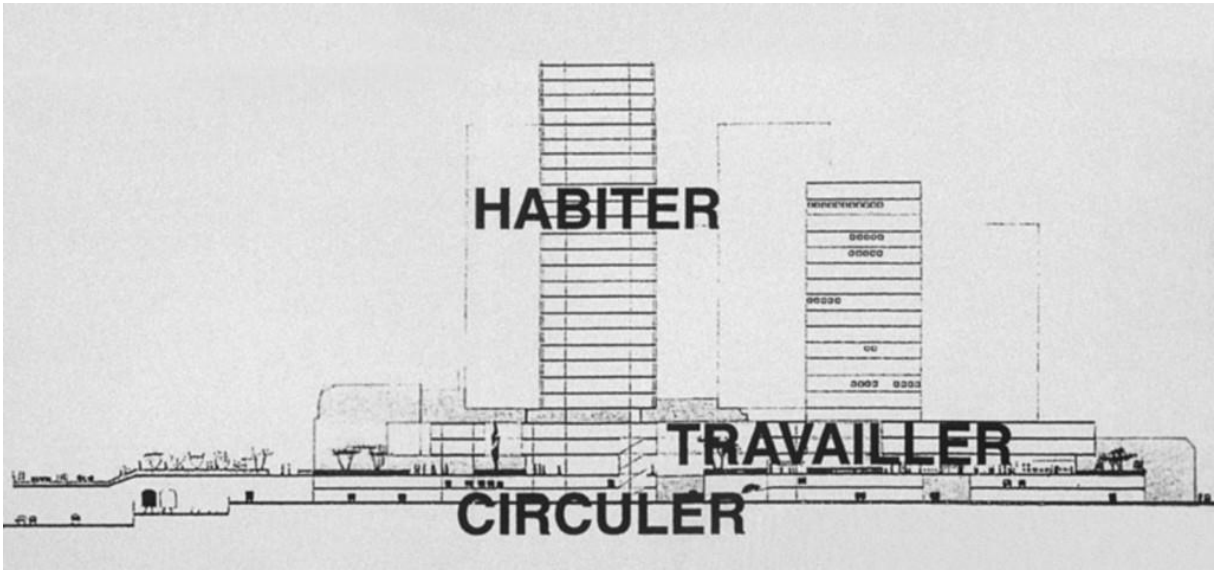

Figure 3.2: Athens Charter
Source: www.chroniques d'architecture.fr

III.1.5. CIAM V: “Housing and leisure”, 1937.

The CIAM V was held in Paris in 1937, this last congress before the outbreak of hostilities, where the chosen theme was "Housing and leisure" and made the proposals of the Athens Charter even more marginal by placing the emphasis on the preservation of historic buildings.

Figure 3.3: Preservation of historic buildings.
Source: www.espacesatypiques.fr

III.1.6. CIAM VI: “Bridgewater, Ten Years of Contemporary Architecture”, 1947

After the Second World War, 12 years had passed since the Athens Charter had launched its proposals that would become the doctrine of the "progressive urban planner" as a "universal recipe."

A new chapter will be added in 1942 under the title "Can our cities survive?", where it will be proposed as a place of creation "Civic Center" although the latter did not offer any alternative to city dwellers to escape the Cartesian prison: housing/work/leisure/transport.

III.1.7. CIAM VII: CIAM grids and the aesthetic question, 1949

Held in Bergano, Italy, which will address the issue of "aesthetics" in this meeting, a group of young people tired of hearing the same old refrains will begin to come forward.

Particularly in the Italian delegation and small groups of protesting students who will form a new trend but always in the spirit of Modern architecture.

III.1.8. CIAM VIII: The Heart of the City, 1951

This congress under the theme "the heart of the city" was held in England, it is marked by the emergence of the new generation which officially recognized "the inadequacy and mediocrity of the Charter of Athens".

III.1.9. CIAM IX: Human Habitat, 1953

Held in Aix-en-Provence, it was marked by interrupted discussions on the “roof of the Marseille housing unit”.

Figure 3.4: Marseille housing unit
Source :https://www.lemoniteur.fr/article/les-habitants-de-la-cite-radieuse-feue-prennent-la-parole.1213764

III.1.10. CIAM X: Habitat, 1956

Prepared by the younger generation, who will be known as the "Group of Ten" or "Team Ten" who will adopt "Each architect must now present himself with his work, ready to take responsibility today, recognizing that there is a new spirit. It is clear that our opposition to the machine concepts of order.

III.2. The international style

The international diffusion of the modern movement, hindered by the rise of fascism and Nazism, was relaunched in the 1930s by the United States, which welcomed European culture. At the same time, the development of large North American companies generated new needs in architectural creation. Although it is related to functionalism and rationalism, this movement owes its specific character to the influence of American companies.

In the 1920s, American architects, notably Albert Kahn, were designing factories that looked as functional as any of the masters of European modernism. In the following decade, Frank Lloyd Wright, who had already designed office buildings that reflected the new principles of corporate organization, designed Johnson Wax's headquarters in Wisconsin. Architects generally followed Kahn's distinction between the construction of so-called production buildings and the architectural representation that corporate headquarters required. The centers of Detroit, Chicago, and New York contrasted with the industrial periphery with lavish decoration, if not overt historicism.

Figure 3.5: Centers of Detroit, Chicago
Source: Expedia.com

In their 1932 exhibition at MoMA (Museum of Modern Art, New York) that defined the International Style, Henry Russell Hitchcock and Philip Johnson presented the heterogeneous aspects of European modernism as a unified entity and demonstrated that Kahn's distinction was meaningless. The large companies that wanted to be resolutely contemporary after the Depression and the Second World War embraced this message. For example, on Park Avenue in New York, Skidmore, Owing & Merrill's Lever House (1952) inaugurated a new style combining a tower that pierced the skyline and a podium that asserted its presence on the ground. Its 24 floors were quickly dominated by Mies van der Roche's Seagram Building opposite it.

Figure 3.6: MoMA
Source: A New York State of Mind.com

As the American economy rocketed toward global hegemony, soon no city in North America seemed complete without skyscrapers of glass and steel. Industrial aesthetics had come to dominate branding as corporate power began to dominate public life.

III.2.1. Johnson Wax Headquarters, Racine, Wisconsin, United States, 1944-1950

Here, Wright assigned each function of the company a building designed to meet its specific needs. Closed to the outside and receiving light from the ceiling, each of these buildings is an incentive to concentration and work. Wright also designed the furniture for

the administrative headquarters. Seen from the outside it appears as a massive form in red brick, the tower was added later to create a focal point.

The lower parts of buildings often united research laboratories with factory production centers. Thus, the John Deere headquarters designed by Eero Saarinen, or its General Motors technical center, evocatively combine the reality and aesthetics of function with brand image. In his works for IBM and Mobil, Eliot Noyes, an American architect and industrial designer, showed how a company's image could be a tool of institutional policy. He used the global economic shocks of the 1970s to suggest another relationship between business and design.

Figure 3.7: Johnson Wax Headquarters, Racine, Wisconsin
Source: www.arquiscopio.com

III.2.2. Lever House, Park Avenue, New York, USA, 1952

This building, built for the Lever Brothers company by Skidmore, Owings and Merrill, demonstrated that European modernism could be adapted to the needs of a business. Its clean, rational-looking design reflected commercial efficiency and openness to new technologies. The idea of a tower and a horizontal lower section on stilts was widely copied later. Later designs evolved a building with carefully calculated dimensions to create corporate environments and to coordinate interior layouts and furnishings.

Figure 3.8: Lever House, Park Avenue, New York
Source: Metalocus.com

Conclusion

From 1928, the progressive movement was theorized and spread through the Athens Charter (1933). The founders of this movement were Le Corbusier, Tony Garnier, Georges Benoit-Levy and Walter Gropius (Choay, 1965). The fundamental principles of the progressives are:

- The ideal human type with constant and scientifically recognized psychophysiological needs and properties.
- Modernity inspired by industry and cubism.
- -The four human functions: living, working, moving around and cultivating body and mind.
- The use of new materials (steel and concrete).
- -The rationalization of (geometric) forms and beauty.
- The old city was razed, with the exception of exceptional buildings.

References

Benevolo, L. (1988), History of modern architecture, Volumes 1 and 2, Paris, Dunod.

Benevolo, L. (1983), History of the city, Marseille, Éditions Parenthèses.

Blau, E. (2008). Urban planning and architecture of Central European cities during the first half of the 20th century. Perspective: 3 .https://doi.org/10.4000/perspective.3245.

Charre, A. (1983). Art and urban planning. Paris: PUF.

Choay, F. (1965). Urban planning, utopias and realities. Paris: Seuil.

Choay, F. (1991), The rule and the model: on the theory of architecture and urban planning, Paris, le Seuil.

Colquhoun, A. (2009), Collected Essays in Architectural Criticism, London, Black Dog Publ.

Davey, N. (1961), A History of Building Materials, London.

Evers, B., THOENES, C. (2011), Theory of Architecture from the Renaissance to the Present, Taschen, Cologne.

Frampton, K. (1985), Modern Architecture, a Critical History, Philippe Sers, Paris.

Frampton, K. (1995), Studies in Tectonic Culture, Cambridge (Mass.), MIT Press.

Frampton, K. (2002), Labour, Work and Architecture: Collected Essays on Architecture and Design, London-New York, Phaidon.

Jacqmin, Y. (2000). A century of architecture and urban planning: 1900-2000, Paris, Moniteur.

Koch, W. (1997). How to recognize styles in architecture, from ancient Greece to the 20th century. Munich, Solar.

Lavedan, P. (1993). History of urban planning in Paris. Paris: Joker.

Le Corbusier. (1992). Urban planning. Paris: EN Collection.

Le Corbusier. (1971). The Charter of Athens. Paris: Seuil.

Le Corbusier. (1966). Way of thinking about urban planning. Paris: Seuil.

Melivin, J. (2011). Discovering Architecture. Paris: Paperback.

Monnet, J. (2000). Urban planning in the Americas. Models of city and models of society. Paris: Karthala

.Pasket, D. (1930). Pages of American History: The Beginnings of the Canal and the Rail.Annals of Economic and Social History: 2(5). pp. 4-25.https://doi.org/10.3406/ahess.1930.1153

Patersan, JH (1990). American cities: aspects and issues. *Bulletin of the Geographical Society of Liège*: 26. pp 33-39.

Ragon, M. (2010). History of modern architecture and urban planning. Volume 3. Paris: Points.

Schittich, C. (2001). Glass architecture in the second half of the 20th century. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 34-58.

Seguim, Y. (2006) "Hiking in Quebec", Ulysse, Montreal, Canada.

Siino, C., Laumiere, F., Leriche, F. (2004). Metropolitanization and large structuring equipment. Toulouse.

Stareb, G. (2001). From the origins to the modern movement. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 9-33.

Course IV: Modern architecture facing new attitudes of architects

Introduction

After World War II, the many reconstructions provided modernism with the much-needed green space to prove its ability to create cities. But debates over issues such as monumentalism and hierarchy within the International Congress of Modern Art, which had defined modernist orthodoxy since its formation in 1928, quickly became controversial.

IV.1. New architectural forms

While the new architecture was becoming a universal style, some of the great leaders of the Modern Movement, such as Le Corbusier, seemed to move away from their initial principles in search of new, more personal forms of expression.

IV.1.1. Our Lady of the High at Ronchamp

In 1950, Le Corbusier had just completed his stunning chapel of Notre Dame du Haut in Ronchamp, France, an intriguing combination of functionalism and purist sculpture. Critics were perplexed by this bizarre, hybrid structure and interpreted it as a "betrayal" of the cause of modern architecture, although they probably did not appreciate the rigorous functionalism of the building's design. Ronchamp was not Le Corbusier's only work of this period. His first religious architectural work was the Ronchamp Chapel, set in a group of small mountains. It is considered a significant monument of the 20th century. It is unique in its kind. All the walls are curved. Their shapes represent the curves of the surrounding mountains.

IV.1.2. Jaoul house

Here the same roughness of detail is apparent: stone walls and huge concrete slabs with vaulted console elements. It is the abundance of the aesthetics of the machine of the Villa Savoye in favor of a more down-to-earth spirit expressed in the most dramatic way.

Figure 4.1: Notre Dame du Haut in Ronchamp
Source : www.IFMA.France.fr.

Figure 4.2: Jouel House
Source: Wiliarquitectura.com

IV.1.3. Convent of Sainte-Marie-de-la-Tourette, Eveux-sur-P'Artiresle, 1957-1960

In this work, Le Corbusier explored the potential of raw concrete in creating various textures, shapes and lighting conditions. In this, he was close to the thinking of brutalism that its defenders preferred to consider as an ethic rather than an aesthetic. The façade visible from afar seems to spring from the mountain, with its glass roofs with irregular spaces between its bays… As was his habit, Le Corbusier did not want to "disguise" his work by applying coatings. He left the raw concrete, with its grain and the traces of the formwork.

Figure 4.3: Sainte-Marie-de-la-Tourette Convent
Source: Associations of Le Corbusier Sites.com

IV.1.4. Guggenheim Museum (1959): a spiral defying Manhattan

In the vertical jungle of New York, the Guggenheim Museum stands like an architectural UFO. Its ascending white spiral, the fruit of 16 years of gestation, taunts the rectilinear skyscrapers of 5th Avenue. Inside, the helical ramp transforms the visit into an architectural promenade where art and space merge in a dizzying choreography. More than a museum, the Guggenheim is a cultural revolution cast in concrete. Tragically, Wright would never see his masterpiece completed, dying a few months before its inauguration and leaving behind an unprecedented architectural testament.

Figure 4.4: Guggenheim Museum
Source: www.wilipedia.fr

IV.2. Structuralism

Drawing on the theories of anthropology, particularly those of Claude Lévi-Strauss, structuralism is based on the premise that the patterns underlying social relations and human behavior can provide a basis for an architecture that is not governed by technology alone.

Led by architects too young to have acted before 1939, the structuralist movement rejected technology as the driving force of architecture and sought archetypes that would remain constant despite historical change. Its leader, Aldo Van Eyck, a member of Team X, had traveled to North Africa and adopted Claude Lévi-Strauss's proposition that all social structure is based on communication and exchange. Acting within these social structures brought meaning and enrichment to life; remaining outside them was a form of exile.

Lévi-Strauss had applied linguistic theory to anthropology. In introducing it to architecture, Van Eyck argued that these underlying patterns had to be identified. Although they obviously required physical structure, the spaces and forms of a building had to foster rather than hinder interaction. However, almost automatically, structuralist buildings froze social structures that should have been flexible into rigid physical structures, and their forms became identifiable images.

The younger generation of architects who shook up the International Congress of Modern Art in the 1950s. Several other members of the group, including Peter and Alison Smithson, proposed large-scale urban plans that they claimed were derived from underlying, if abstract, patterns. Le Corbusier joined the party, working on a final project for the Venice hospital that had the great merit of never being built. The most successful of these projects was the master

plan for the Free University of Berlin, designed by the Candilis-Josic-Woods team, whose liberal ideals and open program were very close to structuralism.

IV.2.1. Beheer Insurance Headquarters, Apeldoorn, Netherlands, 1970-1972

In Herman Hertzberger's original vision of a modern office, the space was broken up into a series of small units, physically and visually connected and often including communal facilities, all within an overall volume.

Figure 4.5: Beheer Insurance Headquarters
Source: www.Flicker.fr

IV.2.2. Yale School of Art and Architecture, 1959

In the United States, Brutalism was "softened" with some interesting additions, such as the reinforced concrete buildings of the Yale School of Art and Architecture (1959), built by Paul Rudolph. The building of the School of Art and Architecture at Yale University (USA) is both massive and sculptural. The structure is intensely composed of towers, beams and large bay windows. The surfaces of the building have a hard texture.

Figure 4.6: Yale School of Art and Architecture
Source :www.ArchEye.fr

IV.2.3. Institute of Civil Engineering University of Leicester, 1959/1963

During the early phase of his modernist career, James Stirling, in collaboration with James Gowan, would design and build three seminal projects; These works demonstrate a clear predilection for bold, solid yet at the same time 'brutalist' forms. The structure is clearly displayed and the technical elements are visibly arranged to form an integral part of the architectural expression.

Figure 4.7: Institute of Civil Engineering University of Leicester
Source :www.ArchEye.fr

IV.3. Regionalism

Regionalism arose as a reaction to the uniformity of modernism. Although by definition they varied according to geographical location, what united the different achievements of regionalism into a coherent tendency, if not a formal movement, was the common attachment to conceptions responding to local conditions, often drawing as much on tradition as on modernism.

As modernism became the dominant architectural movement in the West, it soon became apparent that, while universally applicable, its innovative qualities, the materials, forms and construction techniques employed by its creators, were sometimes difficult to transfer. Le Corbusier took up these challenges in the new city of Chandigarh, India. There, with his collaborators Max Fry and Jane Drew, he recognised that the Indian climate and building industry required adaptations.

From the ebullient and eclectic Bruce Goff in Oklahoma to the exquisite sensibility of Geoffrey Baw in Sri Lanka, many other architects found their own way to integrate the formal

principles of modernism by using local materials and drawing on indigenous traditions. Kenneth Frampton, in his seminal work Towards a Critical Regionalism, retrospectively acknowledged a trend that had begun decades earlier, but offered theoretical legitimacy to the diffusion of modernist aims by adapting them to local conditions such as climate, light, and topography.

Regionalism found particularly favourable echoes in areas where a critical stance towards international modernism was combined with a political dimension, as in Latin America and India. The works of Luis Barragan in Mexico and Oscar Niemeyer in Brazil represent living variants of modernism. In both cases, they are supported by innovative engineering that contributes to the creation of extraordinarily dynamic forms that are at least as specific to national traditions as to the Bauhaus.

Indian architecture is less spectacular in appearance. For urban planners like Charles Correa and Raj Rewal, heritage is a source of inspiration but should not be copied because it can benefit from the contributions of modernism and its social dimensions absent from the Indian architectural tradition. Their work is a subtle synthesis of the two influences.

Towards the middle of the 20th century, the architectural and urban production in Algeria merged with that of France. Modern architecture became globalized, by the hands of French architects, and spread to all French cities as well as those of its colonies. The progression of the urban fabric of the Algerian city was done outside the historical context. With a new layout and an image of modern architecture, it adapted to the evolution of architecture in the world: buildings that stood out for their height, and for their tinted facade and neglecting their aesthetic aspect. Major urban development works were launched to build facilities, subdivisions and large complexes.

IV.3.1. Parliament, Kotte (outside Colombo), 1979-1982

Conceived as an island with an axial relationship to the centre of Colombo, this postcolonial monument is typical of regionalism - as it incorporates local spatial concepts and materials into a framework that owes much to modernism.

IV.3.2. Contemporary Art Museum of Niterol, 1991-1996

Brazil developed its own tradition of modernism, largely thanks to Oscar Niemeyer. One of his recurring themes is his use of concrete structures, here supporting a form reminiscent of a spaceship that appears suspended.

Figure 4.8: Parliament, Kotte
Source :www.Alamy.fr

Figure 4.9: Niterol Museum of Contemporary Art
Source :www.wikipedia.fr

IV.3.3. University of Constantine, 1969-1972

The most representative work by Niemeyer in Algeria is the educational complex of the University of Constantine, now called University Mentouri Constantine. The project was commissioned by President Houari Boumedienne, who remained in power from 1965-1978 and coordinated by the education minister Seddik Benyahia. Situated on a plateau with panoramic views of the city of Constantine. This is the third largest city and far from the Algerian capital, Algiers, about 400 miles east. As in the University of Brasilia, Niemeyer combines in a single volume all the faculties. The educational complex buildings are arranged around a vast public space. Of the more than forty buildings that formed the original project, the program was summarized in two blocks. First block, Designed for classrooms, is the most outstanding volume. Second block, is located laboratories and consists of a flag-shaped curve. Between these blocks there are other buildings that make up the complex, they found the lecture hall, library, administration building, gymnasium and accommodations, while the latter were never finished. The project was planned underground connections between buildings, but they were never made.

Figure 4.10: University of Constantine
Source :www.El Wattan.fr

IV.3.4. Seybous Hotel in Annaba, 1975

As if to underline his presence, the architect Pouillon, invited by the state to build tourist complexes throughout the country, left his mark by designing the Seybouse hotel built in the center of the city, a great symbol of modern architecture in Annaba.

Figure 4.11: Seybous Hotel
Source :www.Tripadvisor.fr

IV.4. Metabolism

Formed in the 1960s, the so-called Metabolist group consisted of young and talented Japanese architects who came of age just after World War II. The group's thinking reflected and responded to the concerns of a society experiencing rapid economic growth. By acting as a group, these architects provided a platform from which Japanese architecture as a whole could have an international influence.

Architectural modernism had a long history in Japan and already had several distinguished representatives when, in the 1950s, the Japanese tradition combined with rapid economic

expansion allowed a decisive break with its European roots. Tange Kenzo, who became the éminence grise of metabolism, tried to incorporate the essence of Japanese tradition into his architecture, referring to it by analogy rather than by faithful copying. He was also influenced by the last works of Le Corbusier, such as the Philips Pavilion at the 1958 World's Fair in Brussels, a bold and completely new form based on mathematical principles.

But it was the advent of consumer electronics that prompted the Metabolists to form a group at the Tokyo World Conference on Design in 1960. The Metabolists argued that electronic gadgets were completely blurring the lines between public and private areas. It was possible to listen to the radio anywhere and engage in private activity in public. They believed that this development had profound implications for homes, which they saw as capsules filled with technology, public institutions as networks and nodes, and cities as experimental sites. Their graphic imagery draws on the sources of science fiction.

The Osaka World Expo in 1970 brought Japanese economic prowess and the Metabolists to the world stage, but by this time the group was beginning to experience differences. Arata Isozaki, who was never officially a member of the group, was searching for elementary, Platonic forms that would serve an ordering function in an ocean of electronics.

The relationship between the realms of the virtual and the real remains a central concern of Japanese architecture today.

IV.4.1. Nagakin Capsule Tower, Tokyo, Japan, KISHO KUROKAWA, 1972

According to the metabolists, industrial technology would allow private spaces to be considered as modules equipped with all the technical means, like the individual capsules of this tower. They were to be connected by the means of communication and transport that constituted the public fabric of the city.

IV.4.2. City Hall, 1991

Tange Kenzo, one of the most prominent Japanese architects of the second half of the 10th century, had a strong influence on metabolism. This late work, with its bold forms and technology as king, evokes his major concerns. The twin towers, over 200 m high, are among the tallest in Tokyo. By placing public space at the top, this building echoes the metabolicist idea that technology is reconfiguring the relationship between public and private domains.

Figure 4.12: Capsule Tower
Source :www.Horssite.fr.

Figure 4.13: Tokyo City Hall
Source: My love for Japan and Tokyo.fr

Conclusion

The modern movement is criticized by architects who reject the existence of an absolute architectural truth and the idea that an architectural and urban solution can resolve social questions.

References

Benevolo, L. (1988), History of modern architecture, Volumes 1 and 2, Paris, Dunod.

Benevolo, L. (1983), History of the city, Marseille, Éditions Parenthèses.

Blau, E. (2008). Urban planning and architecture of Central European cities during the first half of the 20th century. Perspective: 3 .https://doi.org/10.4000/perspective.3245.

Charre, A. (1983). Art and urban planning. Paris: PUF.

Choay, F. (1965). Urban planning, utopias and realities. Paris: Seuil.

Choay, F. (1991), The rule and the model: on the theory of architecture and urban planning, Paris, le Seuil.

Colquhoun, A. (2009), Collected Essays in Architectural Criticism, London, Black Dog Publ.

Davey, N. (1961), A History of Building Materials, London.

Evers, B., THOENES, C. (2011), Theory of Architecture from the Renaissance to the Present, Taschen, Cologne.

Frampton, K. (1985), Modern Architecture, a Critical History, Philippe Sers, Paris.

Frampton, K. (1995), Studies in Tectonic Culture, Cambridge (Mass.), MIT Press.

Frampton, K. (2002), Labour, Work and Architecture: Collected Essays on Architecture and Design, London-New York, Phaidon.

Jacqmin, Y. (2000). A century of architecture and urban planning: 1900-2000, Paris, Moniteur.

Koch, W. (1997). How to recognize styles in architecture, from ancient Greece to the 20th century. Munich, Solar.

Lavedan, P. (1993). History of urban planning in Paris. Paris: Joker.

Le Corbusier. (1992). Urban planning. Paris: EN Collection.

Le Corbusier. (1971). The Charter of Athens. Paris: Seuil.

Le Corbusier. (1966). Way of thinking about urban planning. Paris: Seuil.

Melivin, J. (2011). Discovering Architecture. Paris: Paperback.

Monnet, J. (2000). Urban planning in the Americas. Models of city and models of society. Paris: Karthala

.Pasket, D. (1930). Pages of American History: The Beginnings of the Canal and the Rail.Annals of Economic and Social History: 2(5). pp. 4-25.https://doi.org/10.3406/ahess.1930.1153

Patersan, JH (1990). American cities: aspects and issues. *Bulletin of the Geographical Society of Liège*: 26. pp 33-39.

Ragon, M. (2010). History of modern architecture and urban planning. Volume 3. Paris: Points.

Schittich, C. (2001). Glass architecture in the second half of the 20th century. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 34-58.

Seguim, Y. (2006) "Hiking in Quebec", Ulysse, Montreal, Canada.

Siino, C., Laumiere, F., Leriche, F. (2004). Metropolitanization and large structuring equipment. Toulouse.

Stareb, G. (2001). From the origins to the modern movement. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 9-33.

Course V: Contemporary architecture

Introduction

After functionalism, from the 1970s onwards, architectural design and project activity have taken shelter behind methodologies in order to emerge from a deep ideological crisis. From the point of view of architectural ideology, the period between 1970 and the end of the 1980s marks a suspension characterized by some heterogeneity in architectural production. In 1979, Jenks wrote his famous phrase: "Modern architecture died in St. Louis, Missouri, on July 15, 1972, at 3:32 p.m." A new architecture named "beyond modernism", "postmodern and supermodern" and "contemporary" with new foundations and guidelines that are molded in the form of architectural currents that manifest themselves through stylistic models, of which we will try to identify the greatest characteristics.

V.1. Postmodernism

Applied to architecture, postmodernism refers to various currents that have sought, since the 1960s, to broaden the scope of meaning and references that architecture can convey and that modernist orthodoxy seemed to stifle until then. Its sources range from historical tradition to popular culture. The unity of this current is expressed by the attachment to the pluralism of form and meaning that it testifies to. Postmodernism exposes the way in which architecture can reconnect with place, tradition and community.

Referring to Adolf Loos, Chrles Jenks (1979) states: "Ornament is not a crime", using this concept for the first time. The mobilization of inherited forms and patterns and reinterpreting them in a new context is the fundamental characteristic of this style, which manifests itself as a violent reaction against the academicization of architectural modernism. Postmodern architecture has the particularity of renewing contact with place, tradition and community. The freedom to connect with (neoclassical) tradition allowed the architect James Stirling to express himself through his Staatsgalerie project (1977-1984).

Robert Venturi is the first and most erudite advocate of postmodernism. Author in 1966 of Complexity and contradiction in Architecture, he manages in a decisive work. The house designed by his mother in Philadelphia, to develop an architecture rich in symbolism. The objective of Venturi, former student of Loui Khan, was not to get rid of modernism but to distance it from what he considered to be a banal commercialism to make it entirely in communication with tradition and meaning.

V.1.1. Vanna Venturi's house, Chestnut Hill, Philadelphia, United States, Robert VENTURI, 1864

Venturi demonstrates with this creation that even a small house can be rich in meaning, references, and symbolism. The chimney is an ancient symbol of family life, the triangular effect of the double-sloped roof recalls a classic pediment and the balanced asymmetry of the windows is a modernist or even constructivist process. The inlaid arch symbolically unites the split function while emphasizing the rupture.

V.1.2. Staatsgalerie, Stuttgart, Germany, James STIRLING, 1977-1984

The spare neoclassical references, such as the cornice, confirm Stirling's monumentalist tendencies, but this is a post-modernist monumentality. The lively colours give this complex mixture of cultural references a popular dimension. Furthermore, at the base, fragments of wall are scattered on the ground as if they had projected outside, revealing the modernist steel framework hidden behind the formalism of the stone masonry.

Figure 5.1: House of Vanna Venturi
Source: www. archilio.fr

Figure 5.2: Staatsgalerie, Stuttgart
Source: www.researche.gate

V.2. High-tech

The term "high-tech" was used in the late 1970s, in a book entitled High Tech. The industrial style and source book of the Home, by Joan Kron and Susan Slesin (1978). It

indicates constructions that could be called "futuristic" or "technological". Another criticism aimed at modern architecture by Reyner Braham (1960) that it is historicist in form and composition in relation to the technological development that accompanies it in the same period.

In a context of space conquest and development of daily technology, high-tech architects guarantee the beauty of the structure and the belief in technology. This style glorifies and values the structural and technical elements by placing them outside the construction or the high-tech facade becomes a wall animated by the constructive elements. The design and construction of the Centre Pompidou by Renzo Piano and Norman Foster, with its radical aesthetics for the time, affirms the apogee of the style.

In the 1950s, the combination of science fiction imagery and the growing availability of consumer gadgets changed the relationship between architecture and technology. The term "techno" defines the way architects attempted to bridge the gap between the imaginary and the real possibilities offered by new technology.

In 1960, the British critic Reyner Banham urged architects to shed their architectural cultural baggage in order to take advantage of technology. He argued that modernism had become mired in an unhealthy, almost historicist obsession with form and composition, at the very moment when automobiles and food processors were supposed to free the individual from social hierarchies and debilitating traditions.

Banham's thinking found several echoes, among others in Cedric Price. Driven by his political commitment as much as his taste for technology, this original, almost unclassifiable architect saw architectural projects as opportunities to reorder society. In collaboration with Joan Littlewood, a theatre director, he proposed a Fun Palace based on seductive industrial imagery that disrupted the conventions of the stage. As for his project entitled Potteries Thinkbelt, he presented higher education as a tool for urban regeneration and social renewal. None of these projects were realized.

The Archigram group also exerted a strong influence through its teaching and its achievements in the field of graphic arts. However, it was also thwarted in its attempts at implementation. Its seductive imagery and its clear affinities with the swinging sixties (the 1960s) seemed to herald new possibilities.

Banham's technophilia, combined with his enthusiasm for California's Case Study houses, helped shape the high-tech architecture of the early work of Richard Rogers and Norman Foster. Fuller was more literally technophilic and deeply influenced by the American Buckminster Fuller. For Rogers, technology was a means to individual fulfilment and a break with tradition and convention. In their technical aesthetic, designs such as Lloyd's headquarters in London displayed a dichotomy as disconcerting as that between fantasy imagery and the reality of gadget consumption first encouraged by technocentrism.

V.2.1. Center Georges-Pompidou, Paris, France, RENZO PIANO and RICHARD ROGERS, 1971-1977

Piano and Rogers won the competition for an arts centre with a radical vision and a claim to democratic access to art. The centre's floors have no walls or columns, and objects, books or exhibitions can be placed anywhere. This design required a very complex infrastructure. Heating, cooling and lighting systems give the rear of the building a monumental expression.

Almost every aspect of this cultural building is a modernist technological idea taken to the extreme. Inside, the modulated, gridded space is reminiscent of a hangar for a "super-cargo", supported by giant support elements.

V.2.2. Sainsbury Center, University of East Anglia, Norwich, England, NORMAN FOSTER, 1978

The raison d'être of British high-tech was to transform structure and, increasingly, facilities such as ventilation and plumbing into expressive forms. In this plastic arts centre that looks like an aircraft hangar, structure and services share an area defined by the framework. Glass walls let in sunlight that raises the interior temperature and is suitable for the art objects.

Figure 5.3: Georges-Pompidou Center
Source: www. archdaily.fr

Figure 5.4: Sainsbury Center
Source: www.dezeen.fr

V.3. Neo-rationalism

Neo-rationalism differs from earlier movements in its belief that architecture is based on an understanding of the patterns of traditional European cities rather than on an abstract structure or form. The development of these cities evolves around fundamental, more or less constant forms that persist despite the change in function. As a vehicle for cultural ideas and values, these stripped-down forms become the essential elements of the new designs.

Neo-rationalism emerged in the 1960s. It focused on the need to reconnect with the heritage of historic cities, particularly in Europe, that had escaped the ravages of industrialization and war. Its practitioners rejected modernist concepts of urban form and argued that the entire fabric of a city—its streets and apartment buildings as well as its monuments—was essential to its character. As these elements evolved over time, they became fixed in elements that endured, whatever their function, and became embedded in the collective memory.

For the German Oswald Ungers and the Italian Aldo Rossi, two of the most eminent neo-rationalists, these forms provide correspondences with the past, their plans are to be reused and reinterpreted as abstract essences and not as models to be copied exactly. Rossi was deeply influenced by the painting of Giorgio de Chirico. His buildings are poignantly austere and their forms seem to want to speak without ever succeeding. What they would have to say seems to draw on the very essence of their cultural tradition, and their inability to express it borders on the tragic. For the neo-rationalists, this situation is due to the inevitable crisis provoked by the alienation to which capitalism has led and to the two catastrophes represented by Nazism and the Soviet regime. Their architectural theories are clearly based on social and political concepts. Rossi adopted some aspects of surrealism, playing with form and scale in designing teapots that resembled buildings and buildings whose scale was impossible to calibrate.

- **Cemetery of San Cataldo, Modena, Italy, ALDO ROSSI**

From 1980 Rossi treats a cemetery as a city of the dead For him, a city is a gathering of archetypal forms that have survived and evolved throughout history, here, the monuments are the red ossuary and a crematorium chimney where, like the living, human remains are housed in sober buildings along arcaded streets Galician Center for Contemporary Art,

Santiago de Compostela, Spain, ALVARO SIZA, 1988-1993 This apparently simple form gradually reveals an extraordinary complexity created by the contrasts with the history of the site, the surrounding monuments and the layout of the streets.

Figure 5.5: San Cataldo Cemetery
Source: www.dezeen.fr

V.4. Deconstructivism

The term "deconstruction" was introduced by Jacques Derrida in 1968 in his book "De la Grammatologie", using terms such as "discontinuous, dislocated, deconstructed, dissociated...", applied here to ontology and metaphysics. In parallel and in the field of architecture, this concept was materialized from 1980 with the aim of renewing architectural forms trivialized by modern architecture. The American architect Philip Johnson presented an exhibition Deconstructivist architecture at the MoMA in New York, offering this style a leap towards the international. The fundamental principles of this style are: a new freedom, relieved of its rationality, the rejection of orthogonality, the multiplication of axes, the refuge of symmetry, the explosion of forms and the expression of tensions.

Deconstructivism, forged from the notion of constructivism and the philosophical concept of deconstruction in the sense of Jacques Derrida, attempted to identify a common ground between a new formal inventiveness and attempts to diversify the theoretical bases of architecture. This style emerged in the 1980s as a reaction to the obvious weaknesses and collapse of modernist conventions.

Political and economic developments, coupled with a new wave of theory, made architecture more diverse in the 1980s than it had been in a generation. The achievements and intellectual foundations of architecture in the 1980s demonstrated this diversity. Taboos on past architecture were broken, and architectural history became a catalogue of

accepted motifs; and architects inclined to intellectual speculation turned to contemporary theories, such as French poststructuralism, in which they found analogies with their desire to do away with modernist orthodoxy. One of the rediscoveries of architectural history was Russian constructivism. It had two major attractions. First, having made little mark on architectural history, it was possible to separate it from the virulent debates on the role of architecture in society that were taking place at the time and to consider its formal inventiveness as proof of creative freedom. Second, being a product of modernism, although it was a variant of the canon, it was an antidote to postmodernism and thus allowed an ideological war to be continued by proxy.

Meanwhile, studies of the syntax of modernism began to draw on Derrida's poststructuralist linguistics. However, attempts to apply deconstruction directly to architecture were never entirely successful. A 1988 MoMA exhibition on deconstructivism attempted to make these connections explicit; it served instead to demonstrate the inherent instability of this position. Computers were about to invade society and enable the construction of the visionary forms that architects had conceived. By the dawn of the new millennium, deconstructivism was all but buried beneath the theatricality of extraordinary forms.

V.4.1. Guggenheim Museum, Bilbao, Spain, FRANK GEHRY, 1997

Gehry rewrote architectural conventions in what was the most famous monument of the 1990s. Using computer programs developed for fighter jets, he created complex forms clad in a titanium skin, the structure oddly positioned between the outer shell and the interior galleries.

V.4.2. Phaeno Science Center, Wolfsburg, Germany, ZAHA HADID, 2005

Zaha Hadid’s best work following her appearance at the MoMA exhibition in 1988 is a testament to both the strengths and weaknesses of deconstructivist architecture. The formal inventiveness is still there. However, rather than being underpinned by some obscure philosophical theory, the forms of her recent works are derived from complex mathematics and can now be analyzed and constructed using the fantastical power of computing.

Figure 5.6: Guggenheim Museum
Source: www.journal des Français à l'étranger.fr

Figure 5.7: Phaeno Science Center
Source:www.alamy.fr

V.5. Post-rationalism

Post-rationalism in architecture is the encounter between the logic of the economist James Galbraith, who considers that in a society of abundance there is no meaningful distinction between luxury and necessity, and that of a complex computer science capable of overturning conventional structural logic. The result is a profusion of consumerist experiences within extraordinarily complex forms.

Before building, one of the most influential contemporary architects, the Dutchman Rem Koolhaas, distinguished himself with an original theoretical work. Since then, New York Délire (Delirious New York), published in 1978, reconstructs the construction of Manhattan as a coherent operation whose program he sets a posteriori.

Capitalism, he argues, established the terms of a new reality. This could have been relative and unstable, but, Koolhaas argues, modernism itself was.

This is the logic of post-rationalism, which is rooted in consumerism, both in the way in which collective wealth disrupts economic relations and the spatial configuration of cities, and in the way in which consumer electronics changes our perception of the environment. Modernism was only one stage in a continuous process and, whatever its formal power, wanting to recreate it is only vain sentimentality. Society, if not architecture, will render obsolete any meaning that its forms may have had. He exposes the limits of the zebra pattern, the rigid division of buildings into alternating bands of space and structures, and seeks to split the levels as if at the end of a fold. Responding to a function is a possibility, not an obligation.

The Sendai Mediatheque in Miyagi, Japan, designed by Toyo Ito, presents analogies in the vertical structure. The solid columns are replaced by towers composed of curvilinear steel tubes that allow people, data and energy to circulate without distinction.

At the stage where aesthetics find their fulfillment in an economic relationship, consumption is the post-rationalist activity par excellence. Increasingly, shops acquire the iconic status of art galleries and the objects they contain are treated as if they were interchangeable.

V.5.1. Tod's store, Tokyo, Japan, TOYO ITO, 2004

Luxury boutiques have become vehicles for avant-garde design. Here, Ito demonstrates his interest in a structure defined by the science of complex computer systems rather than Newtonian physics in order to determine a field of spatial experimentation.

V.5.2. Congrexpo palace, Lille, France, REM KOOLHAAS/OFFICE FOR METROPOLITAN ARCHITECTURE (OMA), 1994

It is the idea of congestion that guided Rem Koolhaas, founder of OMA, in the organization of the Euralille district (1988-1996) which is intended to be a staging of uncertainty, an exaltation of movement and networks, of densification and a certain modern confusion. The Congrexpo palace (1990-1994) illustrates his theory of bigness according to which, beyond a certain size, the construction becomes impersonal and escapes any dialogue with the urban context.

Figure 5.8: Tod's store
Source: www.journal des Français à l'étranger.fr

Figure 5.9: Congrexpo palace
Source: www.alamy.fr

Conclusion

Contemporary architecture globalizes unique projects through remarkable styles: post-modernism: reconnecting the past and the modern, high-tech: exposing technology through structure, neo-rationalism: continuity of postmodernism, deconstructivism: deceiving the eye and post-rationalism: triumphing over the computer system.

References

Benevolo, L. (1988), History of modern architecture, Volumes 1 and 2, Paris, Dunod.

Benevolo, L. (1983), History of the city, Marseille, Éditions Parenthèses.

Blau, E. (2008). Urban planning and architecture of Central European cities during the first half of the 20th century. Perspective: 3.https://doi.org/10.4000/perspective.3245.

Charre, A. (1983). Art and urban planning. Paris: PUF.

Choay, F. (1965). Urban planning, utopias and realities. Paris: Seuil.

Choay, F. (1991), The rule and the model: on the theory of architecture and urban planning, Paris, le Seuil.

Colquhoun, A. (2009), Collected Essays in Architectural Criticism, London, Black Dog Publ.

Davey, N. (1961), A History of Building Materials, London.

Djouad, FZ. and Spiga, S. 2018. Architectural production in Annaba: between neglected heritage and desired contemporaneity. Synthese: Sciences et Thecnologies,36, pp. 49-60. DO: Iasjp.cerist.dz/en/article/128523.

Evers, B., THOENES, C. (2011), Theory of Architecture from the Renaissance to the Present, Taschen, Cologne.

Frampton, K. (1985), Modern Architecture, a Critical History, Philippe Sers, Paris.

Frampton, K. (1995), Studies in Tectonic Culture, Cambridge (Mass.), MIT Press.

Frampton, K. (2002), Labour, Work and Architecture: Collected Essays on Architecture and Design, London-New York, Phaidon.

Jacqmin, Y. (2000). A century of architecture and urban planning: 1900-2000, Paris, Moniteur.

Koch, W. (1997). How to recognize styles in architecture, from ancient Greece to the 20th century. Munich, Solar.

Lavedan, P. (1993). History of urban planning in Paris. Paris: Joker.

Le Corbusier. (1992). Urban planning. Paris: EN Collection.

Le Corbusier. (1971). The Charter of Athens. Paris: Seuil.

Le Corbusier. (1966). Way of thinking about urban planning. Paris: Seuil.

Melivin, J. (2011). Discovering Architecture. Paris: Paperback.

Monnet, J. (2000). Urban planning in the Americas. Models of city and models of society. Paris: Karthala

.Pasket, D. (1930). Pages of American History: The Beginnings of the Canal and the Rail.Annals of Economic and Social History: 2(5). pp. 4-25.https://doi.org/10.3406/ahess.1930.1153

Patersan, JH (1990). American cities: aspects and issues. *Bulletin of the Geographical Society of Liège*: 26. pp 33-39.

Ragon, M. (2010). History of modern architecture and urban planning. Volume 3. Paris: Points.

Schittich, C. (2001). Glass architecture in the second half of the 20th century. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 34-58.

Seguim, Y. (2006) "Hiking in Quebec", Ulysse, Montreal, Canada.

Siino, C., Laumiere, F., Leriche, F. (2004). Metropolitanization and large structuring equipment. Toulouse.

Stareb, G. (2001). From the origins to the modern movement. In: Schittich, C. and Debord, D. (eds.) Building in the city, PPUR, Paris, France, pp. 9-33.

Cours VI: L’architecture et la nature

Introduction

Un lien étroit existe entre l’homme et la nature, souvent nourri par le développement des besoins humains dans les multiples facettes de la vie. Ce rapport que chaque individu a avec la nature se transpose dans la ville, il est alors créé à différente échelle: celle du territoire, de la planification spatiale, de la composition urbaine, et de l’espace architecturale.

VI.1. L’architecture biophilique

En architecture, le design biophilique sert à équilibrer les besoins humains avec la valeur et les considérations des environnements et des processus naturels, et intègre les aspects et les qualités de ces éléments dans la conception architecturale.

Les principes du design biophilique sont:

- La nature dans l’espace où l'expérience directe de la nature: Le contact réel avec les éléments naturels de l'environnement bâti (la lumière naturelle, l'air, la végétation, les animaux, l'eau, les paysages, etc).

- Les analogues naturels où l'expérience indirecte de la nature: Le contact avec la représentation ou l'image de la nature, des processus particuliers caractéristiques du monde naturel((des images et des œuvres d'art, des matériaux naturels, des ornements inspirés par des formes présentes dans la nature, etc).

- La nature de l’espace où l’expérience de l'espace et du lieu: Les caractéristiques spatiales de l'environnement naturel qui ont contribué à faire progresser la santé et le bienêtre humains. (Prospect et refuge, complexité organisée, Intégration des pièces aux ensembles, etc).

VI.2. L'architecture durable

VI.2.1. Le développement durable

- La crise environnementale

-L'effet de serre est un phénomène naturel, mais il est aujourd'hui perturbé par les gaz rejetés dans l'atmosphère et par certaines activités humaines.

- Le changement climatique est une évolution naturelle du climat, désormais fortement influencée par les activités humaines.

-Le réchauffement climatique fait peser sur l'homme de nombreuses menaces, parmi lesquelles : l'augmentation des sècheresses, l'évolution du cycle de l'eau, la fonte des glaciers, le développement des maladies transmissibles par les moustiques et parasites, la dégradation de la biodiversité et de la qualité de l'air…

- La prise de conscience

Des conférences mondiales pour protéger le monde et la nature ont été réalisées[1].

Conférences	Décisions
1913 l'UNESCO	Protection de la nature cerner les limites de la croissance économique et démographique La définition des interactions entre écologie et économie La publication d'un rapport de la stratégie mondiale pour la conservation un engagement collectif est possible sur la protection de la couche d'ozone
1968 ROM	
1971 Halte à la croissance	
1972 l'environnement naturel	
1980 L'union internationale	
1987 Commission mondiale	
1992 2^{éme} sommet de la terre à RIO de Janeiro	**Parmi les textes élaborés à la conférence de Rio, le plus volumineux est l'agenda 21" qui constitue à lui seul un véritable plan de développement durable au 21e siècle. Le chapitre 28 de l' "Agenda 21" des Nations Unies reconnaît, entre autres principes,**

[1] https://www.un.org/fr/conferences/environment/index

	l'importance fondamentale du rôle des collectivités locales dans l'application concrète du concept de DD.
1994 Campagne européenne	L'élaboration de l'agenda 21 La réduction de l'émission de six gaz a effet de serre un plan d'actions ciblé autour de grandes priorités
1997 Le Protocole de Kyoto	
2002 Sommet de Johannesburg	
2005 Protocole de KYOTO	

Figure VI.1 : Des conférences mondiales pour protéger le monde et la nature
Source : https://www.un.org/fr/conferences/environment/index, adapté par : F-Z.Djouad (2021)

VI.2.2. Définition et principes de développement durable

C'est un développement qui répond aux besoins des générations du présent sans compromettre ceux des générations futures. Il repose sur trois piliers :

- L'économie : l'utilisation raisonnée des ressources et milieux naturels, une évolution des relations internationales (commerce équitable, etc.) et une intégration des coûts sociaux et environnementaux dans le prix des biens et des services.
- Le social : la satisfaction des besoins essentiels des populations, la lutte contre la pauvreté et l'exclusion, la réduction des inégalités et le respect des cultures.
- L'environnement : la gestion durable des ressources naturelles , le maintien des grands équilibres écologiques (climat, diversité biologique, océans, forêts…), la réduction des risques et la prévention des impacts environnementaux.

Figure 2.2 : Les trois piliers de développement durable.
Source : https://www.montage-maintenance.com/developpement-durable/

VI.2.3. Développement architectural durable

- La haute qualité environnementale

La Haute Qualité Environnementale est une démarche qui vise à limiter à court et à long terme les impacts environnementaux d'une opération de construction ou de réhabilitation, tout en assurant aux occupants des conditions de vie saine et confortable.

Ce concept est apparu en France au début des années 1990, aujourd'hui c'est une marque déposée.

La démarche HQE est un exemple concret de l'application du développement durable au domaine du bâtiment. Elle est à la fois un défi écologique, une exigence sociale et un enjeu économique. Les maîtres d'ouvrage disposent d'un meilleur contrôle de l'acte de bâtir en structurant leurs objectifs autour de quatorze cibles.

- Les objectifs de la démarche HQE
- Établir des relations harmonieuses entre le bâtiment et son environnement.
- Économiser les ressources naturelles en optimisant leur usage et en réduisant les pollutions.
- Accroître le confort, le bien-être et la qualité de vie des utilisateurs.
- Réduire les nuisances et les risques concernant la santé.
- -Minimiser les consommations d'eau et d'énergie.

Les 14 cibles sont :

Eco-construction

1 relation harmonieuse des bâtiments avec leur environnement immédiat
2 choix intégré des produits et des matériaux de construction
3 chantier à faibles nuisances

Confort

8 confort hygrométrique

9 confort acoustique

10 confort visuel

11 confort olfactif

Eco-gestion

4 gestion de l’énergie
5 gestion de l’eau
6 gestion des déchets d’activité.
7 gestion de l’entretien et de la maintenance.

Santé

12 qualité sanitaire des espaces .

13 qualité sanitaire de l’air .

14 qualité sanitaire de l’eau.

VI.3. L’architecture écologique

Les tenants du «high-tech » se tournèrent vers l'écologisme quand se développa le sentiment que l'on ne pouvait pas s'en remettre à la seule technologie pour créer des formes. En revanche, introduire la notion de développement durable permettait d'expérimenter de nouvelles approches tant au niveau de la forme que dans l'emploi de matériaux, tout en ayant recours au meilleur de l'informatique.

Un peu à la façon dont le rationalisme structural utilisait les mathématiques pour étayer des formes architecturales, c'est la notion de développement durable qui soutient la conception innovante propre à l'écologisme.

Autrefois, les bâtiments vernaculaires faisaient appel à des compétences et des matériaux locaux dont la forme était parfaitement adaptée à leur environnement, ils étaient par nature plus durables que les constructions dotées d'une esthétique étrangère ayant recours à des matériaux importés.

Les tenants de l'architecture durable ont la volonté d'adopter une approche holistique: prise en compte de l'environnement et des conditions climatiques (pluviosité, vents dominants, etc.), évaluation du rapport existant entre ces facteurs et la fonction du bâtiment. Pour ce faire, ils utilisent l'imagerie informatique capable de déterminer avec précision les

performances d'un immeuble et d'étudier les effets de la plus infime modification d'un plan. Les architectes et les designers peuvent ainsi vérifier que leurs conceptions ont la forme, l'orientation et la fini- tion les mieux adaptées pour des activités et des sites donnés.

Les effets esthétiques produits varient considérablement et sont parfois paradoxaux. Avec leurs doubles ou triples épaisseurs de verre qui agissent comme tampon et canalisent l'excédent de chaleur, les serres ne sont plus forcé- ment un gaspillage d'énergie; quant aux dalles de sol et aux structures, elles peuvent servir à absorber le surplus de chaleur et moduler la température.

Lorsqu'ils en ont la possibilité, les architectes modèlent intégralement un bâtiment dans une forme originale qui améliore la luminosité et l'aération naturelles. Cependant, dans certain site urbain, la forme du bâtiment est imposée et l'amélioration d'un immeuble conventionnel peut passer par l'addition de conduits et de cheminées extérieures qui facilitent la circulation de l'air à l'intérieur. D'autres gestes imperceptibles à l'œil peuvent également produire des effets en termes d'économie d'énergie, par exemple, élargissant le champ expérimental de l'architecture.

VI.3.1. Centre culturel Jean-Marie Tjibaou, Nouméa, Nouvelle-Calédonie, RENZO PIANO, 1991-1998

Entièrement dédié à la culture kanake, ce plan comporte dix interprétations des cases kanakes, à structure en bois. Il répond à une volonté d'allier les traditions et les matériaux locaux au savoir-faire occidental, une approche sensible de la mondialisation.

Figure VI.3 : Centre culturel Jean-Marie
Source : www.viry-fayat-groupefayat.fr

VI.3.2. Complexe de bureaux, Stockley Park, Londres, Angleterre, IAN RITCHIE, 1990 En utilisant des protections solaires et des parois en verre traité spécialement, lan

Ritchie a tenté ici de démontrer qu'un immeuble répondant à l'image et aux attentes des entreprises modernes ne doit pas nécessairement dilapider des ressources naturelles.

Figure VI.4 : Complexe de bureaux, Stockley Park
Source : www.eas.architects.fr

VI.4. L’architecture Bioclimatique

L'architecture bioclimatique est une sous-discipline de l'architecture qui recherche un équilibre entre la conception et la construction de l'habitat, son milieu (climat, environnement, ...) et les modes et rythmes de vie des habitants.

L'architecture bioclimatique permet de réduire les besoins énergétiques, de maintenir des températures agréables, de contrôler l'humidité et de favoriser l'éclairage naturel. Cette discipline est notamment utilisée pour la construction d'un bâtiment haute qualité environnementale (HQE).

Dans un pays tempéré, une maison bioclimatique peut arriver à fournir plus des deux tiers de ses besoins de chauffage uniquement grâce au soleil.

VI.4.1. Les objectifs de l’architecture bioclimatique

- stocker l'énergie ainsi captée
- capter le rayonnement solaire
- distribuer cette chaleur dans l'habitat
- réguler la chaleur
- éviter les déperditions dues au vent

VI.4.2. Le bien être thermique

Ne pas avoir trop froid, ni trop chaud, ne pas sentir de courants d’air désagréables.

- par conduction : au contact direct d'un corps plus chaud ou plus froid, par exemple quand on se lave les mains à l'eau chaude, ou que l'on marche pied nus sur un carrelage frais ;
  -par convection : il s'agit des échanges de chaleur ente le corps et l'air ambiant, d'autant plus importants que l'écart de température entre les deux est grand. La vitesse de l'air accentue ces échanges ;
  - par évaporation : en passant de l'état liquide à l'état gazeux, l'eau absorbe des calories. La transpiration, en s'évaporant, rafraîchit la surface de la peau ;
  - par rayonnement (ou radiation) : ce sont les échanges de rayonnements infrarouges entre le corps et les parois, qu'elles soient froides (une vitre simple en hiver absorbe la chaleur du cors) ou chaudes (un mur chauffé par le soleil réchauffe le corps, même sans le toucher).

VI.4.3. Les fonctions de l'enveloppe

Profiter des éléments favorables du climat et écarter ceux qui sont défavorables.

Pour la saison froide :

- Capter les calories solaires.
- Les stocker (pour pouvoir en bénéficier au moment opportun).
- Conserver ces calories gratuites et éviter également la déperdition des apports intérieurs (chauffage et autres apports internes).
- Aider à une distribution efficace de l'ensemble de ces calories dans l'espace habité.

Pour la saison chaude :

- Protéger du rayonnement solaire.
- Eviter la pénétration des calories.
- Dissiper les calories excédentaires.
- On peut y ajouter le rafraîchissement et la minimisation des apports internes.

Pour les demi-saisons :

L'enveloppe doit pouvoir s'adapter de manière simple aux besoins par une combinaison de ces deux stratégies.

VI.5. L'architecture biomimétique

Le terme biomimétisme apparait dès 1980 et fut vulgarisé par la biologiste et environnementaliste Janine Benyus, l'auteur de l'ouvrage Biomimicry : Innovation

Inspired by Nature (Benyus, 1997). Le biomimétisme est défini dans son livre comme une nouvelle science qui étudie la nature en vue de l'imiter ou de s'en inspirer pour résoudre des problèmes humains. Benyus suggère de regarder la nature comme modèle, mesure ou mentor.

- La nature comme modèle : le biomimétisme étudie les modèles de la nature, puis imite ou s'inspire de leurs caractéristiques pour résoudre des problèmes humains.
- La nature comme mesure : le biomimétisme propose d'utiliser les standards de l'écologie pour juger de la « justesse » de nos innovations. Après 3,8 milliards d'années d'évolution, la nature a appris ce qui marche, ce qui est approprié, ce qui dure.
- La nature comme mentor : le biomimétisme est une nouvelle manière de considérer et d'apprécier la nature. Il introduit une ère fondée non pas sur ce que nous pouvons extraire du monde naturel mais sur ce que l'on peut apprendre de lui.

VI.5.1. Les niveaux du biomimétisme en architecture

- **Le niveau organisme** : se réfère à un être spécifique comme une plante ou un animal et peut impliquer l'imitation d'une partie de l'organisme ou du tout.

Par exemple, le coléoptère namibien Stenocara a inspiré un certain nombre d'architectures biomimétiques comme le Centre hydrologique de l'Université de Namibie, conçu par Matthew Parkers de KSS Architectes ou encore le Teatro del aqua, un projet non construit conçu par Michael Pawlyn. En effet, la carapace de ce scarabée est composée d'une succession de microbosses attirant l'eau et de rainures cireuses qui la font circuler. Ces caractéristiques ont directement inspiré ces architectes pour concevoir les capteurs de brouillard de leurs bâtiments (forme et matériau).

Figure VI.5 : (a) Le coléoptère namibien Stenocara, (b) Le Centre hydrologique de l'Université de Namibie, conçu par Matthew Parkers de KSS Architectes.
Source : Cruz, 2016.

- **Le niveau comportement :** se réfère au comportement d'un être et peut inclure la traduction d'un aspect du comportement de l'organisme et éventuellement sa relation à un contexte plus large.

Les travaux de l'architecte Mick Pearce6 illustrent parfaitement le niveau comportement du biomimétisme. Son bâtiment le plus remarquable est l'Eastgate Building à Harare au Zimbabwe. Il est en partie fondé sur des techniques de ventilation et de régulation de température observées dans les termitières dans le but de créer une ambiance thermique stable à l'intérieur de l'édifice. Ce système de ventilation passive permet de diminuer considérablement les consommations d'énergie. Une étude comparative menée avec six autres bâtiments a montré que l'Eastgate Building utilise 35 % moins d'énergie qu'un bâtiment conventionnel avec air conditionné, soit une économie estimée à environ 3,5 millions de dollars sur cinq ans.

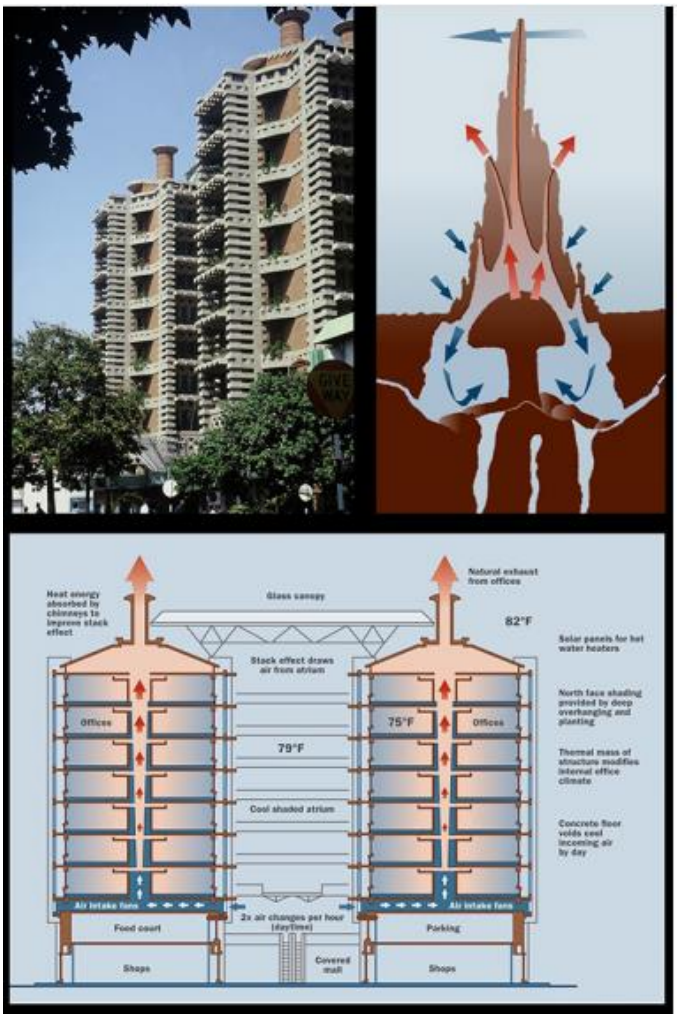

Figure VI.6 : Le système de ventilation de la termitière.
Source : Illustrations de Daniel Gallant/Foundry Zero

- **Le troisième niveau est l'imitation d'un écosystème :** entier et des principes qui lui permettent de remplir les fonctions avec succès.

Il y a plusieurs cas d'imitation de la nature au niveau écosystème, mais la ville de Kalundborg au Danemark8, en tant que premier exemple de symbiose industrielle, en est une parfaite illustration (figure 8.a). La coopération, le recyclage et l'échange de flux de matière ou d'énergie ont permis aux entreprises basées dans le parc industriel de minimiser leur impact environnemental en améliorant leur productivité. Sur un principe similaire une entreprise californienne, ReGen Villages9, créée par des enseignants-chercheurs de l'université de Standford, s'est associée à un cabinet d'architecture danois EFFEKT10 pour concevoir un village 100 % écologique en Hollande. Ce village, dont la construction a débuté en 2016, fonctionnera en circuit fermé et sera entièrement autonome et respectueux de l'environnement. Il sera capable de produire sa propre énergie, sa propre agriculture et même de recycler ses déchets.

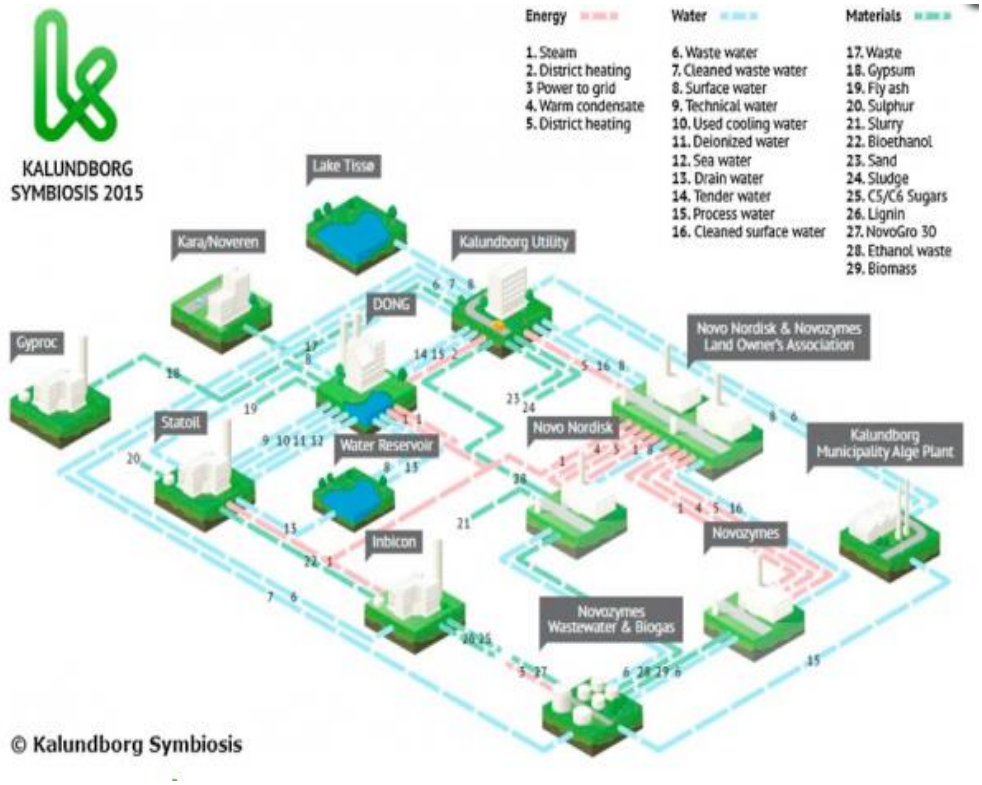

Figure VI.7: L'écologie industrielle de la Ville de Kalundborg, Copenhague.
Source : Gulipac, 2016

À l'intérieur de chacun de ces trois niveaux, cinq dimensions supplémentaires d'imitation existent : La conception peut être biomimétique par exemple en termes de à quoi ça ressemble (forme), en quoi c'est fait (matériau), comment c'est fait (construction), comment ça travaille (processus) ou qu'est-ce que ça fait (fonction).

Conclusion

Au début des années 1970, les dysfonctionnements d'un mode de développement ont fortement dénoncé les limites. Les effets de l'industrialisation (production de déchets en masse, pollutions, etc.) apparaissent alors et la désertification, la déforestation, le "trou" dans la couche d'ozone constituent, une décennie plus tard, de nouvelles sources d'inquiétude, bientôt suivies par l'érosion de la biodiversité et le réchauffement climatique.

Au fil du temps les architectes ont été amenés à concevoir des projets qui allient leur désir de s'exprimer artistiquement avec les nécessités imposées par la fonctionnalité sociale prise dans son ensemble. A ces contraintes est venu se greffer un élément nouveau qui est de l'homme et dont la préservation est devenu l'environnement naturel vitale pour ce dernier.

Références

Bechlem, R., Djouad, F.Z., & Salah-Salah, H. (2024). Morphological Analysis of Public Spaces and Their Contribution to Urban Resilience in Guelma, Algeria. Journal Of Mediterranean Cities, 4(1), 167-177. https://doi.org/10.38027/mediterranean-cities_vol4no1_10

Bechlem, R., Djouad, F.Z., & Salah-Salah, H. (2024, May). Morphological Analysis Of Public Spaces And Their Contribution To Urban Resilience In Guelma, Algeria. The 7th International Conference of Contemporary Affairs in Architecture and Urbanism (ICCAUA-2024), https://www.iccaua2024.com.

Bechlem, R., Djouad F.Z, Dafri, I, Debbache, A., Salah-Salah, H. (2024, September). Weaving nature into the urban tapestry: biophilic design, public spaces, and identity in the city. IEREK's conference on Cities' Identity Through Architecture and Arts (CITAA) – 8th Edition, https://www.ierek.com/events/cities-identity-through-architecture-and-arts-citaa-8th-edition#overview

Chalas, Y. (2001). Villes contemporaines. Paris : Cercle d'art.

Decelle, S. Panassier, C.,Pinchart, A. (2007). La Nature dans la ville. La Salamandre : 170.

Delevoy, R.L., Culot, M., Van Loo A. (1998). La Cambre, 1928-1978. Paris : AAM.

Djouad, F.Z., Mebarki, A. (2023, June). The landscape and Biophilic Perspectives of the New City of Guelma Hdjar El Mangoub. 6th International Conference of Contemporary Affairs in Architecture and Urbanism (ICCAUA-2023), https://www.iccaua2023.com.

Djouad F-Z. 2021. City-Nature relationship in a world renowned nature reserve: the case of El-kala national park in easten Algeria. Journal of Urban Planning and Developpement, 148(1), paper 0521067. DOI : 10.1061/(ASCE)UP.1943-5444.0000814.

Djouad, F.Z. 2022. The Biophilic Approach to Qualify the Inhabitant-Nature Relationship in the Domestic Space: The Case of the City of El-Kala, Algeria, Architecture and urban planning, 17 (1), pp. 103–111. https://doi.org/10.2478/aup-2021-0010.

Djouad F Z and Spiga S (2010). L'étude du rapport ville/nature à travers la ville d'El kala, (Est Algérien). Mémoire de magistère , Université de Annaba. Algérie.

Gauthier, M (2009). Urbanisme et développement durable. Environnement Urbain / Urban Environment : 3. URL: http://journals.openedition.org/eue/892

Gumuchdjian, P. Rogers, R. Gilbert , C. Duriau J.(2008).Des villes pour une petite planète Paris : Le Moniteur.

Melivin, J. (2011). Discovering Architecture. Paris: Paperback.

Rossi, A. (1984). L'architecture de la ville. Paris : L'Equerre.

Claval, P. (1981). La logique des villes. Paris : Litec.

Chayaamor-Heil, N., Guéna F., Hannachi-Belkadi, N. (2018). Biomimétisme en architecture. État, méthodes et outils, Les Cahiers de la recherche architecturale urbaine et paysagère. DOI : https://doi.org/10.4000/craup.309

Course VII: Architecture in the digital age

Introduction

Today, more than half of the population lives in cities. Statistics predict that by 2050 this proportion will rise to two thirds, and that the city will represent only 2% of the planet's surface, consuming 75% of the energy produced. Statistics also show that the city is responsible for 80% of CO2 emissions. The smart city is a new model proposed to solve the problems of the contemporary city by relying on technology and artificial intelligence.

VII. 1. Computer-aided design

The Origin in the foundations of architectural drawing in the European Renaissance: the 15th century goes back to the appearance of perspective in 1400, giving birth to a new perspective on the Drawing-reality, drawing-project relationship as well as the birth of the contemporary profession of Architect.

Computer-aided design appeared during the 1980s thanks to the development of increasingly efficient hardware and software platforms allowing the computing power of processors, low production costs, real-time information exchange and the rationalization of working time.

VII.1.1. The objectives of CAD

The development of computer-aided design platforms for architecture was driven by the following objectives:

-Help with the design of the Architectural Project

-Representation of the project's graphic documents.

VII.1.2. CAD tools

Graphic data with attribute information relating to the drawing: vector or raster.

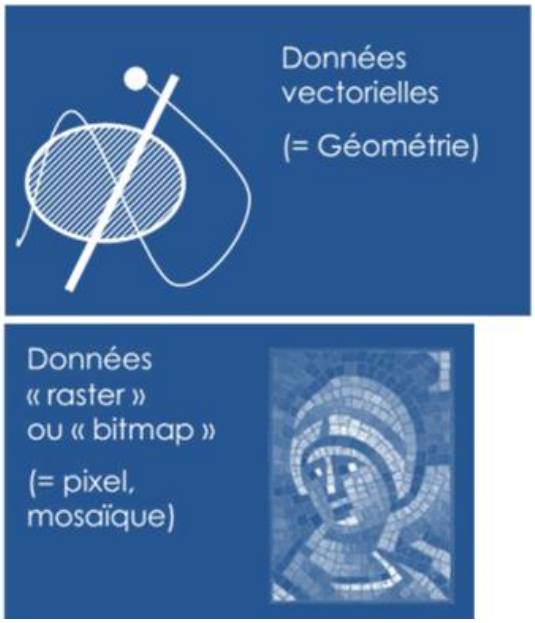

Figure 7.1: Vector and Raster Data
Source: https://educnet.enpc.fr.

VII.1.3. CAD software

-Image processing and editing software allows "pixel by pixel" work on a raster image: Photoshop, Photopaint, Corel photo, Gimp, etc.

- Knowledge base systems combine vector and alphanumeric data: GIS: Quantum GIS – Mapinfo – ArcGIS –Grass – etc.

- Computer Aided Design software allows you to model and represent a given environment and process its properties. CAD software:

- Catya – Solid Works (aeronautics, mechanics)
- Arcview (architecture)
- AutoCAD (urban planning, architecture, mechanics)
- 3D studio (computer-generated images)
- 3DS max, Maya (special effects)
- Computer Aided Design software allows you to illustrate a project with relatively simple vectors.
- Main CAD or DTP software:
- Illustrator – Inkscape – Corel Draw.

VII.1.3. CAD applied in architecture

In CAD applied to architecture, the common approach in a coherent workflow relating to the modeling of a project in the form of a digital model concerns the following elements:

- Tools or components: These tools make up the project and are largely configurable and parameterizable in advance,
- The digital model or Project is the modeled whole formed by all its components,
- Digital graphic documents: Plans, facades, sections, axonometric details obtained by CAD software from the digital model
- Digital layouts of graphic documents
- Digital and physical publication process (tracing-printing) of layouts.

VII.2. Building Information Modeling (BIM)

BIM represents the process of developing and using a computer-generated model to simulate several tasks such as planning, design, construction of a building. The resulting model called: "Building information model" and equipped with a great wealth of information included, "object-oriented", intelligent and also equipped with a parametric digital representation. It appeared thanks to the birth of the first parametric design software platforms related to architecture: ArchiCAD© in 1987 but the term BIM in 2004.

VII.2.1. BIM functionalities

BIM works to build the digital model:

- Extract all quantitative data from the project
- Be able to perform precise visualizations of all stages of the project.
- Precision and compliance with current standards.
- Reduce or eliminate geometry errors in building components.
- Detection of interference between building components.
- Establishing energy and environmental simulations very early in the study of projects,
- Precise determination of material properties which can be easily selected on the market, always thanks to BIM,
- Efficient management of the construction site,
- Facilitation and precision of building maintenance tasks.
- Management of complex areas due to their difficulty, such as the preservation of heritage.

VII.2.2. Artificial intelligence (AI) at the service of BIM

Artificial intelligence is emerging as a catalyst for innovation in BIM. With AI, professionals can automate complex tasks, optimize design, and detect errors before they impact the construction site.

The growing interest in integrating artificial intelligence (AI) into building information modeling (BIM) heralds a new climate, bringing unprecedented opportunities and efficiencies for architects, engineers, manufacturers, and other city stakeholders. This integration is shaping a future where sustainability, efficiency, cost, and time management are being redefined, so now is the perfect time to take advantage of this new wave of innovation. Generative AI uses algorithms to create multiple design alternatives based on predefined parameters and project constraints. In the context of BIM, these constraints can include space utilization, energy efficiency, material considerations, light exposure, and more. AI can use specific Revit families that make up the BIM model, along with all the project information, to generate optimal design solutions that meet all of these criteria.

Figure 7.2: AI in the service of architecture
Source: Tw3 Partners.

VII.2.3. Augmented Reality (AR) and Virtual Reality (VR)

AR and VR offer unprecedented possibilities for visualizing BIM models. These technologies allow users to immerse themselves in their projects, facilitating decision-making and presentation to clients.

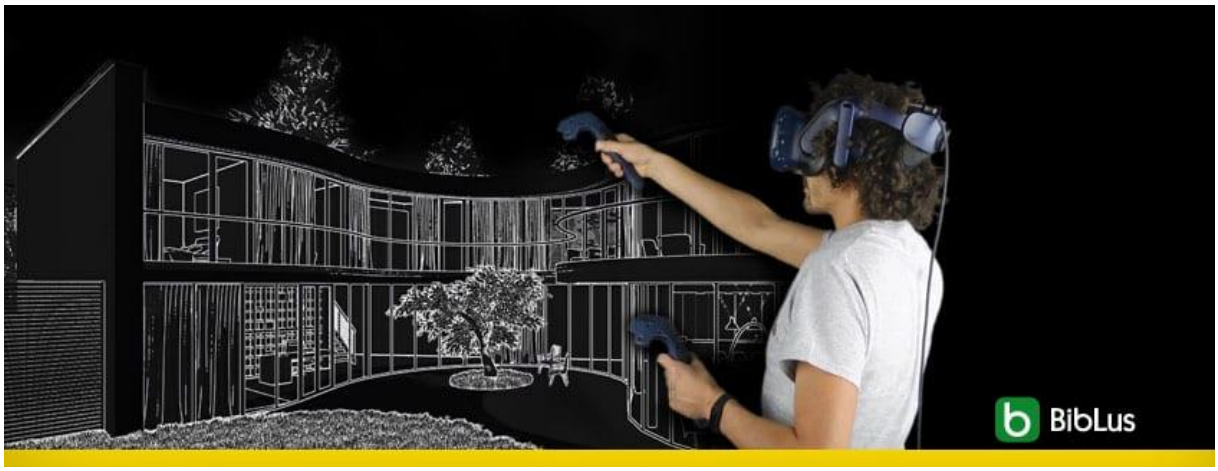

Figure 7.3: Virtuous reality and BIM
Source: biblus-ACCA-Software

VII.2.4. Automation of tasks using Generative Design and scripts

Generative Design, already present in Revit, allows you to quickly explore multiple design alternatives based on specific criteria (costs, materials, energy performance, etc.). Coupled with Dynamo scripts, this tool democratizes the automation of repetitive tasks.

VII.2.5. Sustainable development integrated into BIM

The pressure to design more eco-responsible buildings is leading to an increased use of energy simulation and carbon analysis tools. Revit already integrates solutions such as Insight to assess energy performance. Tools already available: plugins for thermal analysis, daylight optimization. Future trends: native integration of environmental standards and carbon footprint indicators into Revit workflows.

VII.2.6. Standardization and interoperability

The development of Open BIM and exchange formats such as IFC strengthens interoperability between software.

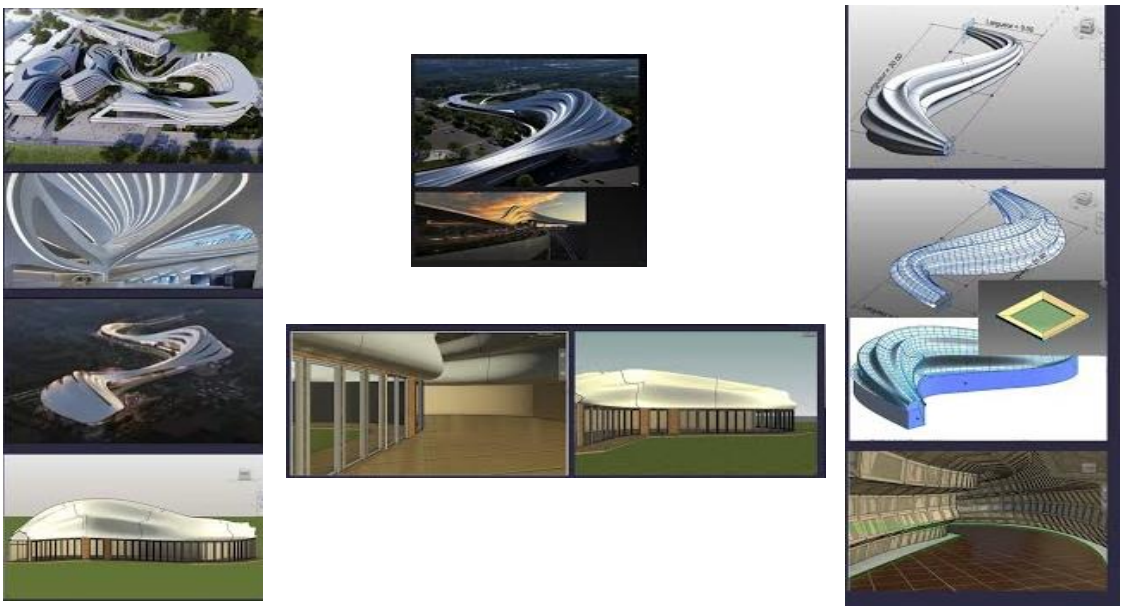

Figure 7.4: Using Rivit in architecture
Source: Tereseta Feugeas, Youtube

Revit users, who often face compatibility issues, will benefit from ongoing improvements to facilitate these exchanges (better data management between Revit and other software (Tekla, ArchiCAD).

VII.2.7. Towards 5D and 6D BIM: cost and life cycle management

BIM is no longer limited to 3D design. Additional dimensions such as 5D (costs) and 6D (life cycle and maintenance) are gaining ground. 5D BIM: integration of costing tools for better cost estimation in real time. 6D BIM: connection with Facility Management software to optimize building maintenance.

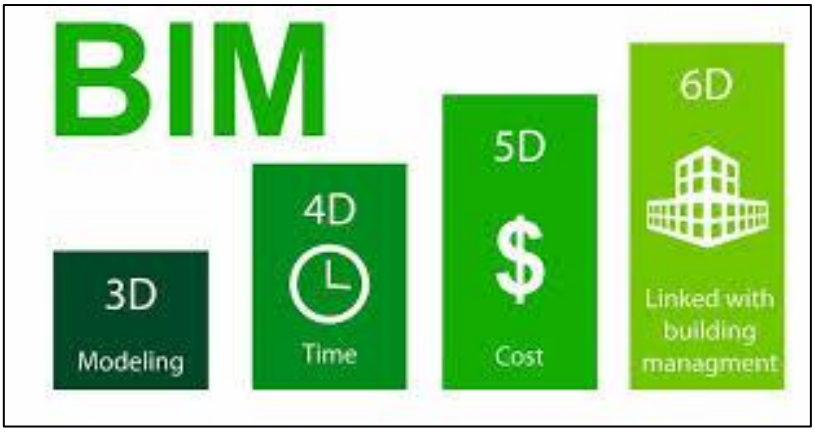

Figure 7.5: BIMs
Source: Eneca.fr

- BIM 0: Classic CAD-CAM
- BIM 1: Isolated digital models
- BIM 2: Collaboration between several trades around an exchange file: *.ifc.
- BIM 3: Total project collaboration in all phases and at all scales.
- BIM 3D: The 3D model with all its attributes: manufacturer, standards, materials, assembly technology.
- BIM 4D: Planning and management of project progress over time.
- BIM 5D: the cost of the Project
- BIM 6D: Various estimates and assessments: energy-environmental.
- BIM 7D: project lifespan.
-

VII.3. Parametricism or Parametric architecture

In recent years, we have been hearing more and more about parametric architecture, parametric conception and parametric design. It is a real technological innovation to generate new and avant-garde forms. Digital or generative architecture is still little known in France and not very widespread in the training and teaching of architects. As for the definitions in French that can be found, they are often ambiguous and complex.

This innovative design method is not new. Internationally, architectural projects using parametric design are becoming more widespread. Thanks to the emergence of digital tools and 3D software, architects are proposing free and non-standard forms and complex structures. They are revolutionizing the stylistic references and representations of traditional architecture. Parametric architecture is an innovative design method, using CAD software based on algorithms. It allows the creation of complex and new forms or structures, in a simple and optimized way while ensuring their feasibility. More than just a digital CAD tool, it is truly a new way of thinking and creating. It allows the architect or designer to extend their creativity, while integrating a greater amount of data from the project sketch. This new approach gave birth to "parametricism". This architectural movement was notably introduced by the Zaha Hadid architecture agency.

With the help of such software, the design process is optimized. We can thus propose innovative and new solutions that meet the needs of customers and project constraints. All this is achieved in record time at a controlled cost.

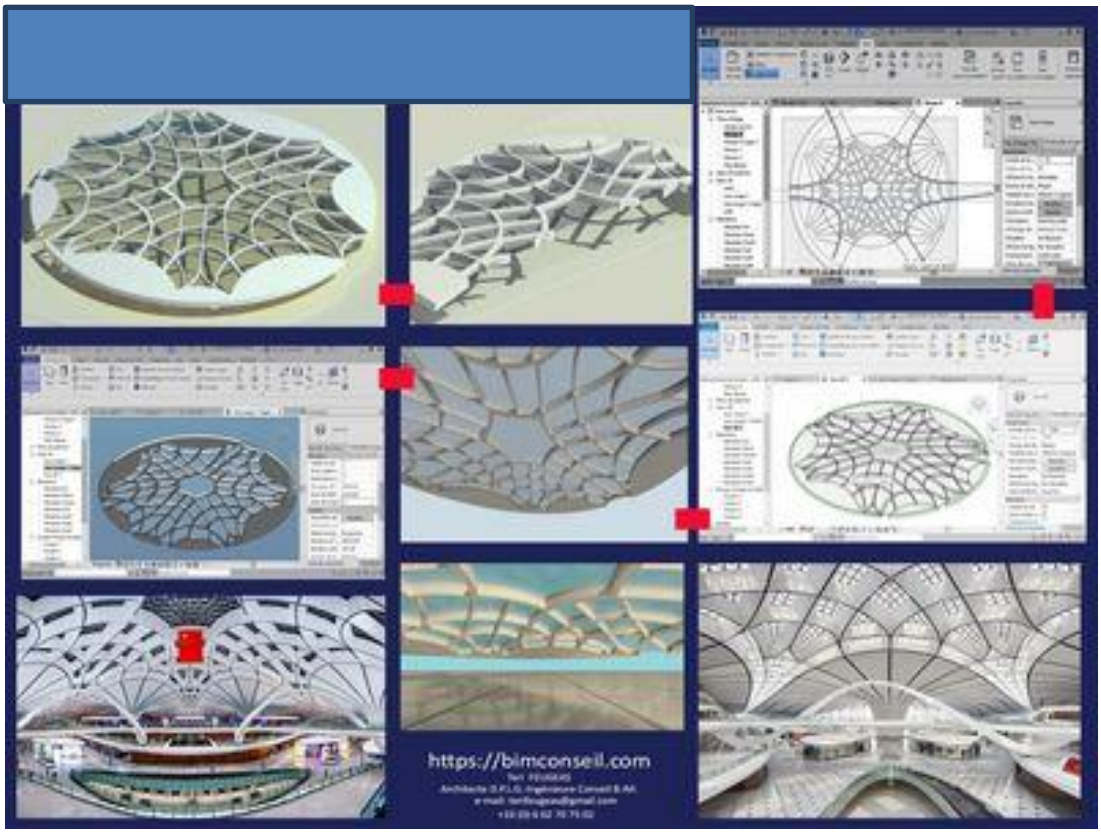

Figure 7.6: Parametric architecture
Source: bimconseil.

VII.3.1. Parametric modeling

Let's start by understanding the term "parametric". It comes from mathematics and refers in particular to parametric equations using a certain number of parameters and variables (for example: x, y, z ...). The variation of these values induces a different result, while respecting the relationship between the different parameters (the equation). The same is true for parametric modeling.

- Modeling from algorithms: The use of software based on algorithms allows to generate a large number of formal variations and technical solutions of an idea, by the variation of defined parameters. These parameters can be technical, structural, environmental, formal, urban, industrial, etc. The algorithmic system would be like the DNA of the architectural project. When the parameters and constraints evolve, the result adapts and is optimized while respecting this DNA. The formal identity and vision of the architect are preserved and reinforced during the development of the project.

- traditional or parametric modeling: Traditional design methods, called "additive", consist of adding elements of the project to create a whole. During the development of the project, technical constraints are taken into account, etc. The parametric approach, on the other hand, goes further. It involves defining the relationship between the elements, which will create the whole and the identity of the project. The formal language is the result of the interaction of the parameters specific to the project.

VII.3.2. Digital tools and 3D software

Parametric design is facilitated today by algorithmic software. There are several such as Grasshopper for Rhino, Dynamo for Revit, Design Script, Generative components, Maya, etc. One of the most used and suitable for architecture is the Grasshopper plug-in that works with the Rhinoceros software.

This software provides access to this innovative practice in a simplified way. Based on algorithm programming and coding, they can be scary. Grasshopper's interface is different from traditional CAD software and may seem complex at first glance.

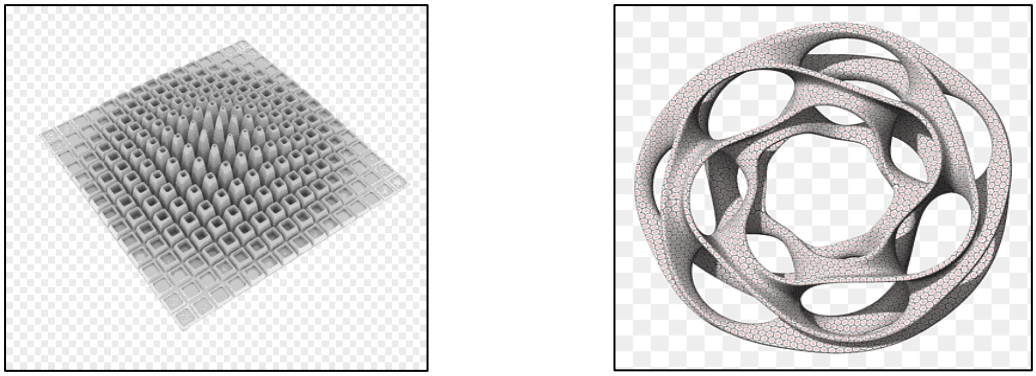

Figure 7.7: With Rhino and Grasshopper
Source: PNGEgg.

VII.3.3. The advantages of parametric design for the architect:

*"We can no longer think of stereotypical architecture, rigid like the cube, the cylinder or the pyramid. Our vision of architecture and urban planning is composed of elements that must become variable, malleable thanks to parameters."*Patrick Schumaker, architect at Zaha Hadid

For many years, the development of digital CAD tools has impacted and optimized the practice of project management. In the same way, parametrics considerably broaden the scope of possibilities in the field of construction. It also redefines the role of the architect, no longer just the creator but the coordinator.

The assistance of software such as Grasshopper allows to go beyond what the "human" mind alone could imagine and design. Of course, it does not replace humans in the process of creation and ideation. It is positioned as a new tool, allowing the architect to go further, with less effort.

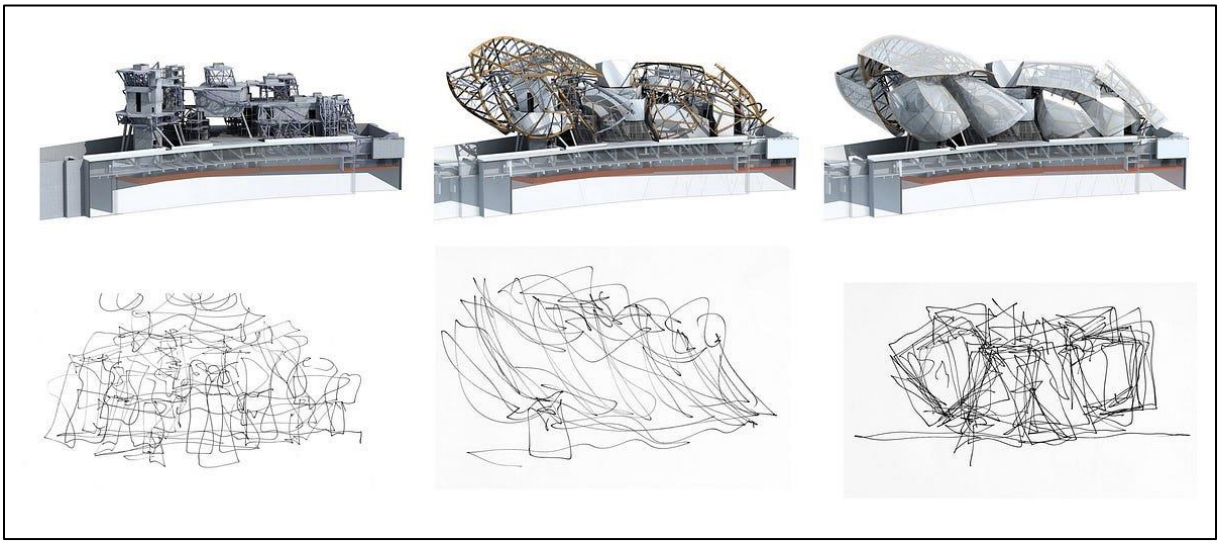

Figure 7.8: From mechanical tools to digital tools, the challenges of parametric design
Source: Meduim.com

VII.4. Smart city

A smart city is a city that relies on the collection and use of data to optimize its organization and management. It understands the behaviors and habits of its residents in order to provide them, in real time, with better information and a better range of services while saving resources more effectively.

Expert Rudolf Giffinger has identified six performance areas of the smart city:

- A smart economy: This is the economic competitiveness of the city. It is measured through factors such as innovation, entrepreneurship, productivity, labor market flexibility and integration into the national and international market.

- Intelligent citizens: In other words, the human and social capital of the city. It is a question, of course, of the level of qualification of the population but also of its plurality, its open-mindedness, its creativity, the quality of social interactions or participation in public life.

- Intelligent governance: That is to say a transparent, transversal – and shared – mode of city administration integrating citizen participation.

- Smart mobility: Giffinger emphasizes local and international access to the city, the existence of connected infrastructures using ICT (information and communication technologies) and innovative, sustainable and safe transport systems. For example: for parking, sensors allow drivers to know, in real time, the availability of spaces to avoid driving around in circles unnecessarily.

- A smart environment: We are talking here about ecology and resource management. The smart city must promote a quality environment (green spaces, air quality), manage its resources sustainably and work to protect the environment. Eco-districts are localized examples of an intelligently managed environment. For example: installing sensors to measure rainwater flow, humidity levels (air and soil), wind, sunshine, atmospheric pressure to adjust the watering of public gardens; to assess the filling of garbage bins for more efficient collection, but also to assess noise, air pollution, temperature, brightness, etc.

- A smart lifestyle: It brings together factors linked to quality of life: culture, health, security, housing, education, tourism, social cohesion, etc.

VII.5. Smart architecture

Architecture is undergoing an unprecedented digital transformation thanks to technological developments, which are revolutionizing the design, construction and management of buildings by facilitating the creation and use of intelligent digital models. As we approach 2030, new trends and innovations are strengthening this movement. Intelligent architecture leverages new technologies and tools to make architectural projects more sustainable. It designs today's buildings to optimize them throughout their life cycle.

VII.6. The advantages for the digital architect

- Expand its creativity and propose new innovative architectures; with a strong architectural “signature”;

- Assistance in the design and modeling of complex shapes;

- Ability to generate formal variations and test many solutions and their feasibility in a short time;

- Automate and adapt the 3D modeling of the project and generate updates very quickly as the project evolves;

- Integrate different constraints and parameters from the start of the design, without reducing the architect's creativity at this phase;

- Facilitated communication and the involvement of different trades, by integrating the skills of each from the start of the project; and approaching a participatory and collaborative architecture

- Optimization of material use and cost control

- Simplification of the construction of new complex shapes and structures through the use of industrial elements and modules.

- Building with new technologies

Conclusion

Digital architecture differentiates itself from the competition and architectural competition. It allows construction professionals to develop a strong identity and unique architectural signature. This is why it is important to include it in the training of tomorrow's architects and engineers.

References

Collective (2008). Book: BIM Handbook, A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors. John Wiley & Sons. Inc. New Jersey.

Mazouz Saïd. (2016). To BIM or not to BIM. Conference given at the 1st BIM days of Biskra. Lacomofa Laboratory. University of Biskra.

Graphisoft. ArchiCAD16 help. (2012).
Gumuchdjian, P. Rogers, R. Gilbert, C. Duriau J.(2008). Cities for a small planet Paris: Le Moniteur.
Rossi, A. (1984). The architecture of the city. Paris: L'Equerre.
Claval, P. (1981). The logic of cities. Paris: Litec.
https://architecturecommerciale.com/les-batiments-les-plus-emblematiques-de-zaha-hadid/
https://www.researchgate.net/publication/351350955_Conception_Parametrique_avec_Rhino_et_Grasshopper https://www.autodesk.com/fr/design-make/articles/intelligent-buildings