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# NATURE IN MODERNIST TRADITION. PRO-ENVIRONMENTAL ANTICIPATIONS IN THE WORK OF LE CORBUSIER

# NATURA W TRADYCJI MODERNIZMU. PROEKOLOGICZNE ANTYCYPACJE W TWÓRCZOŚCI LE CORBUSIERA

Abstract

The objective of this article is to investigate the links between the concept of integrating architecture with nature in the work of Le Corbusier and the contemporary concept of environmentally-focused architecture. Pro-environmental anticipations presented in the context of the multi-threaded inspirations drawn by Le Corbusier from European tradition made it possible to more fully integrate modernist heritage in the contemporary dialogue between architecture and the natural environment. The current practice of legitimising green architecture primarily by improving energy performance and countering climate change leads to a depreciation of architecture's symbolic layer. The study was performed by analysing selected designs and projects by Le Corbusier, as well as on the basis of studies of source material – works of architecture and theoretical writings, literature studies and comparative analyses.

*Keywords: architecture and nature, pro-environmental architecture, Le Corbusier*

Streszczenie

Celem artykułu jest zbadanie związków pomiędzy ideą integracji architektury i natury w twórczości Le Corbusiera a współczesną koncepcją architektury zorientowanej środowiskowo. Proekologiczne antycypacje ukazane w kontekście wielowątkowych inspiracji zaczerpniętych przez Le Corbusiera z europejskiej tradycji pozwoliłyby na pełniejsze włączenie dziedzictwa modernizmu we współczesny dialog architektury ze środowiskiem przyrodniczym. Badania przeprowadzono w oparciu o analizę wybranych projektów i realizacji twórcy, studia materiałów źródłowych – dzieł architektonicznych i pism teoretycznych, studia literaturowe i analizy porównawcze.

*Słowa kluczowe: architektura i natura, architektura proekologiczna, Le Corbusier*

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*I do not feel as though I am breaking away from tradition; rather, I continue it. All the great endeavours of the past confirm that every state of mind corresponds to a state of affairs*[2]

## 1. INTRODUCTION

Modernist avant-garde is present in architectural tradition largely because of Le Corbusier's rhetorical figure of the rational machine. Fetishicised technology and mass production are pointed to as the fundamental source of new forms. Meanwhile, the experience of nature was perhaps equally strong and introduced many unsettling ideas to the modernist concept of architecture as infatuation with new technologies. Pointing to these elements in Le Corbusier's work once again and reinterpreting them in the context of the present ecological crisis of the anthropocene can be an interesting start for a discussion on the subject of tradition and modernity in architecture.

The problem associated with nature in the architecture of the first half of the twentieth century is not limited to a post-romantic reaction to the growing significance of industry that secession had been in its time. Linkages with the natural environment were deliberately practiced during the period of modernism as well; operating with organic form, sensitivity to the landscape and designing buildings in accordance with the physiography of the terrain was prominently displayed in the work of Frank Lloyd Wright or Alvar Aalto. Most importantly, it is functionalism that is derived from this new understanding of the natural order. Form following function had its beginning in the rationalisation of nature, which acted in accordance with the laws of evolution, giving each organ a shape suitable to the role it plays within the entire organism.

## 2. ECOLOGY, PRO-ENVIRONMENTAL ARCHITECTURE AND ITS CRITICS

At present, in the strictest sense – ecology is a "science of the structure and functioning of nature at various levels of its organisation"[3], while the more common meaning of the word denotes measures aimed to protect nature. The term itself has been known from as early as 1869, when it was first used by Ernst Haeckel, a German zoologist and evolutionist, when he pointed out the dependencies between living organisms and the environment. However, the growing negative human impact on nature on the planetary scale remained unacknowledged for a long time. In the period of Le Corbusier's creative activity nature was seen as an inexhaustible reservoir of resources to be exploited. The beginnings of contemporary ecologism, commonly associated with environmental protection, were the 1960's and the 1970's – a period after Le Corbusier's death[4]. It is noteworthy, however, that it was

[2] Le Corbusier, *Urbanistyka*, transl., T. Swoboda, Fundacja Centrum Architektury, Warszawa 2015, p. 321.

[3] R. Andrzejewski, *Ekologia* [in:] *Powszechna encyklopedia PWN*, version 1, Wydawnictwo Naukowe PWN, Warszawa 2009.

[4] The chronology of events leading up to the shaping of contemporary ecological awareness is cited in

during the period of the interwar avant-garde movements that coincided with the beginnings of the contemporary understanding of the order of the world, including in the continuation of the Enlightenment-era discussion on the opposition between culture and nature and the "stance of the modernists can be perceived as a sort of an archaeology of contemporary environmental debates"[5].

As the scholars of Le Corbusier's legacy point out, his work should be discussed in the cultural context appropriate to its time. When seen from a broader perspective, it is an expression of sensitivity and an effort meant to formulate an urgent answer to environmental requirements. It was, however, a one-sided relation, as it was about resource exploitation and not protection. Already in the introduction to his "Urbanism" did the architect state: "The City! It is man's dominance over nature. It is human action against nature, a human organ of protection and work. It is creation"[6]. We should therefore carefully approach attempts at pointing out direct parallels between Le Corbusier's projects and theoretical works and the contemporary architecture of sustainable development, adaptation to climate change, increasing resilience or the alleviation of the consequences of these changes[7]. Nevertheless we should take note that pro-environmental architecture, based on the notion of sustainable development, "is closely tied with striving to provide users with appropriate living and working conditions – a comfort of the physical indoor environment, one that is flexible and capable of the rearrangement of its spaces, ensuring high aesthetic quality and contact with the natural conditions of the surroundings"[8], with the qualities mentioned here fully characterising Le Corbusier's work. The concrete relief on one of the walls of the Housing Unit in Berlin-Westend (1957) – "retablir les conditions de nature" ("restore natural conditions") and its accompanying inscriptions that were an abridged version of Corbusier's philosophy of integrating architecture and the natural environment – sound exceedingly topical during the second decade of the twenty-first century.

Some architects, for instance Peter Eisenmann, deny the right of green or sustainable architecture to be called true architecture[9]. This radical stance is a result of a belief that architecture is ruled by its own aesthetic and is a sovereign art of shaping space. However, it is not ruled out that due to significant environmental changes caused by human activity, similarly as in the

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most publications concerning pro-environmental architecture. e.g.: J. Marchwiński, K. Zielonko-Jung, *Współczesna architektura proekologiczna*, Państwowe Wydawnictwo Naukowe PWN SA, Warszawa 2014, p. X.

[5] A. Jach, P. Kurc-Maj, introduction to the book *Superorganizm. Awangarda i doświadczenie przyrody,* Muzeum Sztuki w Łodzi, Łódź 2017, p. 14. The book accompanied the exhibition of the same name, organised in the period between February and May of 2017 at the Art Museum – ms$^2$. The exposition was opened by a drawing by Le Corbusier from the collection of the Museum of Modern Art in New York: *Plans for Algiers and Barcelona and "cité-jardin verticale" (vertical garden city) drawing made during a lecture in Chicago November 27, 1935,* pastel on paper, 101 x 278,1 cm.

[6] Le Corbusier, *Urbanistyka*, *op. cit.*, p. 25.

[7] E. Dummett, *Green space and cosmic order: Le Corbusier's understanding of nature*, Ph.D, University of Edinburgh 2007; http://www.fondationlecorbusier.fr/corbuweb/default.aspx (access: 30.06.2019).

[8] J. Marchwiński, K. Zielonko-Jung, *op. cit.*, p. X.

[9] L. Hosey, *The Shape of Green: Aesthetics, Ecology, and Design*, Island Press, Washington 2012, p. 2. According to Peter Eisenmann the terms "green" and "sustainable development" having nothing in common with architecture.

period of the modern movement, "architecture stands before a changed code" once again[10]. And, similarly to how it was then, when its new paradigm was created along with the birth of the modern movement, we can currently observe resistance to change and a departure from well-entrenched traditions that set the rules for creating and evaluating architecture.

One can assume that the expansion of the aesthetic and ideological foundations of the pro-environmental architecture movement by a stronger anchoring in the tradition of the modernist avant-garde could make it possible to increase the power of its message and make it more appealing as an art.

## 3. ELEMENTS OF TRADITION IN THE WORK OF LE CORBUSIER

The artistic identity of the young Charles-Édouard Jeanneret-Gris was shaped in the environment of the art of the end of the nineteenth and the beginning of the twentieth century[11]. His distinct relation with nature was a result of education, which he received at an arts and crafts school in his hometown of La-Chaux-de-Fonds. He later reminisced that his teacher – "a man of the woods", by employing open-air nature studies and because of his deep love of nature, had also made his students "men of the woods". "My master had said, »The only inspiration is nature: she alone is true and can underpin human striving. But do not work at nature as the landscapers do, under a single aspect: inquire its underlying cause, its form, its vital development and, by introducing ornamentation, achieve the all-embracing picture«"[12]. It was, in essence, the ideological programme of the Arts and Crafts and the Art Nouveau movements, which, while significantly modified by the rejection of the ornament was, in its most essential form, nevertheless constantly existed in modernism, as an organic trend present in parallel to the geometric one. Nature, whose extension was sought in science and engineering ("industry, as strong as the forces of nature"[13]), remained a central reference point, both as an inexhaustible source of inspiration and the guarantee of the reliability of genuine art[14].

The classical school of the study of nature had left a permanent mark on the architect's imagination and affected his vision of the world. Numerous sketchbooks, notebooks and photographs, as well as a rich epistolographic legacy, show a personality shaped in the literary and visual culture of the turn of the century. The young Charles-Édouard Jeanneret-Gris, in accordance with the traditional model of artistic education, went on a series of tours during which he studied the architecture of ancient Greece, the Italian Renaissance and the Baroque.

[10] Le Corbusier, *W stronę architektury*, transl. T. Swoboda, Fundacja Centrum Architektury, Warszawa 2012., p. 301. In his time, Le Corbusier identified the causes of fundamental change as an effect of accumulated transformations in the sphere of industry and the organisation of work and construction.

[11] Paradoxically, in many spheres of art, the strength of contesting the status quo typically meant equally strong ties with tradition. The specific method of "creation by destruction" was fully employed by Le Corbusier. More on the same subject can found in: A. Rabaça (ed.), *Le Corbusier, History and Tradition*, Imprensa da Universidade de Coimbra, Coimbra 2017, DOI : 10.14195/978-989-26-1338-3 (access: 30.06.2019).

[12] T. Benton, J. L. Cohen, *Le Corbusier. Le Grand*, Phaidon Press, London – New York 2014, p. 27.

[13] Le Corbusier, *W stronę architektury*, *op. cit.*, p. 253.

[14] The aforementioned book and exhibition entitled *Superorganizm. Awangarda i doświadczenie przyrody* demonstrated the anything but marginal presence of natural inspirations in the heritage of the modernist avant-garde from the perspective of the development of period science and the search for man's place in a changing world.

The Val d'Ema Carthusian monastery left a particular impression on him. The austere regulations of the order, along with its houses for the monks, became models for the organisation of the space and life of the residents of his future designs.

As an architect and urban planner that was fully aware of his goals, Le Corbusier continued the great tradition of Paris' functional and spatial reform. He undoubtedly drew on the French experience of engineering innovations in urban redevelopment. The grand scope of the urban plans of Haussmann was not without influence on his conceptual proposals of new metropolises and, something we should not forget, is that Le Corbusier was under the strong influence of the German architect Heinrich Tessenow, who familiarised him with the theory and practice of the construction of garden cities.

Le Corbusier – although he himself had never disclosed it – was also reportedly under the strong influence of the work of the eighteenth-century French architect François-Joseph Belanger, who was also prized by the freemasons for his geometric language of architectural forms. According to scholar J. K. Birksted, Belanger's work constituted a direct inspiration for the Ville Savoye[15]. This appears to be yet another piece of evidence of just how strong were the great innovator's links with the tradition of European art.

## 4. ELEMENTS OF PRO-ENVIRONMENTAL ARCHITECTURAL IN THE WORK OF LE CORBUSIER

*The sun is the dictator: according to climates, according to seasons[16]. The trees are kings; men, under their cover, live in the domain of proportion; the link "nature – men" is re-established[17].*

The integration of architecture with the natural environment in Le Corbusier's work was realised on multiple planes, using various means on the architectural and urban scale. Below is an attempt at their systematisation in the form of a working list, backed by selected examples from the architect's rich body of work.

Contemplation of nature
- panoramic strip windows,
- rooftop observation decks,
- architectural frames for views.

Integration with greenery
- green on the architectural scale,
  → houses in gardens, trees placed in courtyards, green terraces on flat roofs,
  → greenery accompanying production plants,
- urban greenery – public parks, belts – seams of greenery.

[15] J. K. Birksted, *Le Corbusier and the Occult*, MIT, Cambridge, London 2009.
[16] *La Maison des hommes,* François de Pierrefeu, Le Corbusier, Éditions Plon, Paris, 1942; from: T. Benton, J. L. Cohen, *op. cit.*, p. 357.
[17] *Ibidem*.

Illumination and insolation
- lumière naturelle – natural light,
- éclairage solaire, ensoleillement – insolation, terraces, loggias, solariums

Passive methods of regulating indoor climate
- natural ventilation, aération naturelle – natural ventilation, cross-ventilation, air exchange,
- brise-soleil – louvres, shaders – limiting undesirable thermal gains from solar radiation,

Active indoor climate regulation methods,
- "respiration exacte" – "proper breathing", "conditioned air"
- "mur neutralisant" – "neutralising wall"
- "aeration ponctuelle" – "point air circulation"

Already in his relatively early project of a modest house for his parents, La Petite Maison on the shores of Lake Geneva (1923) did the architect include the fundamental threads of his creative approach. In the plan, the elevations and the perspective drawings we can see a clear pursuit of unity with the landscape. To this day, the property, which has survived in its original shape, strikes with the amount of greenery when viewed on satellite imagery – through its the lush roof and garden. A massive wall with an opening that frames a view of the lake was placed near the house, for as its designer claimed, in order to see the landscape it had had to be framed like a painting. The terrace of the semi-detached house on the Weissenhof estate in Stuttgart (1927), which also features a roofed terrace and has been equipped with greenery, is a large horizontal frame that exposes the assets of the landscape, just as the horizontal windows (which were also used in La Petite Maison and the Ville Savoye), allowing the residents to delight themselves in an unobstructed view of the surroundings.

The motif of framing a view of nature appears in later works, but does so primarily in his breakthrough creation – the Villa Savoye in Poissy (1931). The window in the wall of the rooftop solarium, which is a culmination of a promenade that leads along a series of ramps from the ground floor onto the highest level of the terrace, is a frame that focuses our attention on the surrounding greenery, a precisely planned frame which turns nature into an object of contemplation. In his original drawing of the Villa Savoye, depicting the rooftop garden, Le Corbusier highlighted the intention to blur the line between the space of the building – the terrace constrained by concrete frames, and the surroundings. The greenery, which clearly plays the role of a natural binding material, is truly eye-catching.

Of note are the less-known designs from the period of the Second World War, when Le Corbusier, searching for an opportunity for professional fulfilment, became involved with the Vichy government. The "murondis" houses (1940) are simple and light, intended for construction by unqualified workers, providing shelter for wartime refugees from natural, easily available materials. They were meant to feature clay walls (mur) covered with a roof supported by thicker branches (rondis), covered with corrugated metal sheets, tree branches, clay, stone and turf[18]. Another example, extraordinary for its time and the circumstances of its origin, is the Green factory (1944) – a munitions production plant, an unbuilt design commissioned by the ministry of armaments of the Vichy government. It is a mature proposal of a new type of

[18] *Ibidem*, pp. 343–347.

workplace, in which, according to the architect's opinion, natural working conditions would be restored to workers by access to daylight and contact with greenery that was to fill the surroundings. In both the written part and the drawings, which maintain a green colour tone, we can see a strong ideological persuasion[19].

Le Corbusier was under enormous influence of the period's hygienistic culture, which promoted physical fitness, a healthy lifestyle, spending time outdoors and sunbathing. This is why it was always so important in his designs to provide natural ventilation and natural light, as well as direct insolation. Immeubles-villas (1922) was a new formula for multi-family housing, wherein each apartment was a sort of a small house with a garden, located on any height above the street, which the design depicted as a wide promenade featuring rows of trees[20]. Over time, the street was to disappear, in order to be replaced with park greenery spreading across a homogenous space between buildings, like in the case of the Unite d'Habitation in Marseilles (1952). Freestanding buildings provided insolation and daylight to rooms. Long apartments, insolated from the east and west, created an opportunity for cross-ventilation and natural ventilation. The large housing block that stood amidst greenery was described as combining within it a sequence of various traditions that Le Corbusier had turned upside down and combined in a creative manner[21]. Apart from the concept of hanging gardens and garden cities[22], the designs of habitation units were influenced by models of monastic architecture and the self-sufficient settlement units by utopian socialists[23].

Some of Le Corbusier designs, as Charles Jencks described them – were either naive or stubbornly erroneous, but their value was in the courage with which they took on significant architectural subject matter, as well as in the originality of the proposed solutions. The price for unrestricted access to nature, the "joy of light and the sun" postulated in theoretical works, was often the discomfort that could be felt in the interiors that were built.

Striving to integrate architecture with the natural environment, the architect came across problems that arise from the use of large glazed partitions: energy consumption (during winter) and excessive thermal gain (during summer). In the Centrosoyuz building in Moscow (1931) and in the Salvation Army building in Paris (1933) he made attempts to create a mechanical "respiration exacte" system – "proper breathing", which was to stabilise the indoor climate of the buildings[24]. It was composed of the "mur neutralisant" – "a neutralising wall", an active air chamber that played the role of a thermal barrier (a precursor to contemporary active facade systems) and the "areation ponctuelle" – "point air circulation", a system of transporting air with regulated temperature to rooms. In Moscow the construction of the installation was abandoned, while in Paris it was only partially built and, after years of occupancy, Le Cor-

[19] *Ibidem*.

[20] *Ibidem*, p. 125–127.

[21] C. Jencks, *Ruch nowoczesny w architekturze*, transl. A. Morawińska, H. Pawlikowska, Wydawnictwa Artystyczne i Filmowe, Warszawa 1987, p. 21.

[22] Le Corbusier, *Urbanistyka*, *op. cit.*, p. 254.

[23] C. Jencks, *Ruch nowoczesny w architekturze*, *op. cit.*, p. 21.

[24] Le Corbusier described his experiences with *respiration exacte* in the chapter "Conditioned air", in: *Kiedy katedry były białe. Podróż do kraju ludzi nieśmiałych*, transl. T. Swoboda, Fundacja Centrum Architektury, Warszawa 2013, pp. 43–46. The matter is analysed more broadly in: L.M. Diaz, R. Southall, *Le Corbusier's Cité de Refuge: historical & technological performance of the air exacte*, [in:] *Polytechnic University of Valencia Congress, LC2015 – Le Corbusier, 50 years later* (access: 30.06.2019); I. F. Solla, *Le Corbusier: a French lesson on 'Murs neutralisants'* (access: 30.06.2019)..

busier was forced to remodel the airtight curtain wall. The purist glass surface, divided with the lines of a two-dimensional pattern, was replaced with a sculptural, colourful and richly articulated spatial form.

After the failure associated with active systems, Le Corbusier turned towards passive solutions and the limiting of thermal energy gains by using brise-soleils – louvres, shutters, "light breakers". Their massive, concrete frames added visual expression to building facades and remain the most effective insolation-reducing solutions to this day, reducing the energy demand for cooling[25, 26].

Trees occupied a special place in Le Corbusier's work. He acknowledged their significance on all scales – from plants entering into a dialogue with buildings (the Meyer Villa, 1926), through the parks and gardens that surrounded them (the Unite d'Habitation in Marseilles, 1952), to complexes of greenery that fundamentally shaped the atmosphere of the city (Ville Contemporaine, 1992, the Athens Charter, 1943, Chandigarh, 1951–1965).

In his youth, in the artistic environment of his hometown of La Chaux-de-Fonds, he grew up surrounded by a cult of trees, in which their stylised motif became the emblem of the so-called "pine style", a local variant of the Swiss secession movement. In Le Corbusier's mature designs, trees were not an ornament that had been reintroduced. It should be assumed that the tree incorporated into the architecture of the "L'Esprit Nouveau" pavilion for the International Exhibition of Modern Decorative and Industrial Arts (1925) was not a measure that had been merely forced by the circumstances. This was confirmed by a series of later projects and the extraordinary expression and symbolism that the tree that grows inside of the Curutchet House in La Plata brings with it (1953).

The author's own declaration is perhaps the best expression of his stance on trees:

> *The sun, space, trees – I have acknowledged them as the fundamental materials of urban planning, conveyors of the "essence of happiness". Through this, I wanted to restore man to the city, to place him at the very heart of a natural environment, of his fundamental emotions. Without trees, he finds himself in the artificial surroundings of his own creations; sometimes, on special occasions, he is allowed to show off his rigour, his cleanliness and the strength of his geometry. But, bereft of trees across the entire city or a part of it, in countless situations in which there is a lack of harmony and grace, when everything resonates with violence, man becomes sad in his poverty and nakedness, lost in a chaotic uncertainty, in the arbitrality of pernicious disorder*[27].

[25] The first ever industrial air conditioning installation, constructed by Willis Carrier, was built in 1902 in the United States, with air conditioning developing further and becoming a separate branch of engineering in the second decade of the twentieth century. The first air conditioning systems provided comfort in public and residential buildings were built in the 1920's. http://www.williscarrier.com/about.php (access: 30.06.2019); Le Corbusier travelled to the US in 1935, so he was familiar with the air conditioning installations of the period (he wrote about them in *Kiedy katedry były białe* (*When the Cathedrals Were White*), pp. 43–46).

[26] Denzer A., *Le Corbusier and the Sun*, http://solarhousehistory.com/blog/2013/10/28/le-corbusier-and-the-sun?rq=le%20corbusier (access: 30.06.2019).

[27] Le Corbusier, *Kiedy katedry były białe. Podróż do kraju ludzi nieśmiałych*, *op. cit.*, p. 93.

## 5. CONCLUSIONS

Charles-Édouard Jeanneret-Gris' personality was shaped by the cultural heritage of Western Europe from the turn of the nineteenth and the twentieth century. Drawing from a rich tradition of art and intellectual currents of his time, he created a unique synthesis which forms an essential part of the international modernist movement. One of its important constituents was a turn towards nature, which in turn had lain at the foundation of contemporary ecological awareness. Le Corbusier did not know of the contemporary problems associated with the exhausting of non-renewable energy sources and anthropogenic climate change, which is why he should not be made into a pioneer of sustainable architecture in the contemporary sense of the word. However, we should acknowledge the innovation and conviction with which he took up the subject of the relationship between architecture and nature. Le Corbusier strived to renew the cosmic harmony between man and nature, a harmony destroyed by the rapid process of urbanisation[28]. In this sense we can consider him an anticipator – in a broad sense of the word – of the pro-environmental approach to architecture and urban planning.

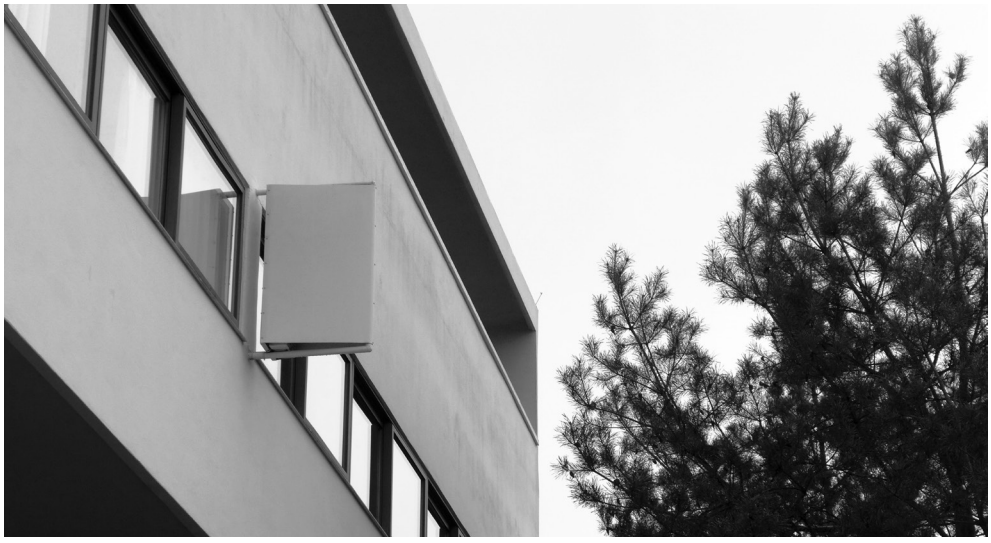
Ill. 1. A window in the solarium wall on top of the Villa Savoye (1931), which is the culmination of a promenade that leads across several ramps from the ground floor onto the highest level of the terrace, a frame that focuses our attention on a view of the surrounding greenery, a planned frame that makes nature an object of contemplation. Original photograph

One of the characteristic qualities of a great body of work is its complexity and multi-threadedness. This also means entanglement with contradictions, including universal and unsolvable ones, like the opposition between building and the undisturbed existence of nature. Knowledge

[28] C. Jencks, *Ruch nowoczesny w architekturze*, *op. cit.*, p. 25.

of these experiences, which, due to their sublime nature, takes on the character of an existential drama[29], must be stored in tradition – in the memory of culture. It is a necessary condition for the preservation of its continuity.

Ill. 2. Window in the wall of the solarium on the roof of the Villa Savoye, view from the north. Original photograph



Ill. 3. Semi-detached house at the Weissenhof estate in Stuttgart (1927). A sequence of panoramic elements of the building – an arcade on the ground floor, a strip of horizontal windows on the first floor and a horizontal terrace framed with a roof and with a view of the surroundings. Original photograph

[29] C. Jencks, *Le Corbusier – tragizm współczesnej architektury,* transl. M.Biegańska, Wydawnictwa Artystyczne i Filmowe, Warszawa 1982, p. 8.

Ill. 4. Terrace on the uppermost storey of the semi-detached house on the Weissenhof estate in Stuttgard. The roof that frames views of the landscape and greenery that is present on the roof of the building provides its residents with contact with nature. Original photograph

## References


[1] Andrzejewski R., *Ekologia* [in:] *Powszechna encyklopedia PWN*, version 1, Wydawnictwo Naukowe PWN, Warszawa 2009.

[2] Benton T., Cohen. J. L., *Le Corbusier. Le Grand*, Phaidon, London – New York 2014.

[3] Birksted J.K.., *Le Corbusier and the Occult*, MIT, Cambridge, London 2009.

[4] Denzer A., *Le Corbusier and the Sun,* http://solarhousehistory.com/blog/2013/10/28/le-corbusier-and-the-sun?rq=le%20corbusier (access: 30.06.2019).

[5] Diaz L.M., Southall R., *Le Corbusier's Cité de Refuge: historical & technological performance of the air exacte* [in:] *Polytechnic University of Valencia Congress, LC2015 - Le Corbusier, 50 years later*, DOI: http://dx.doi.org/10.4995/LC2015.2015.796 (access: 30.06.2019).

[6] E. Dummett, *Green space and cosmic order: Le Corbusier's understanding of nature*, Ph.D, University of Edinburgh 2007, http://www.fondationlecorbusier.fr/corbuweb/default.aspx (access: 30.06.2019).

[7] Hosey L., *The Shape of Green: Aesthetics, Ecology, and Design*, 3rd ed. edition, Island Press, Washington 2012.

[8] Jach A., Kurc-Maj P., *Superorganizm. Awangarda i doświadczenie przyrody*, Muzeum Sztuki w Łodzi, Łódź 2017.

[9] Jencks C., *Le Corbusier – tragizm współczesnej architektury*, transl. M. Biegańska, Wydawnictwa Artystyczne i Filmowe, Warszawa 1982.

[10] Jencks C., *Ruch nowoczesny w architekturze*, transl. A. Morawińska, H. Pawlikowska H., Wydawnictwa Artystyczne i Filmowe, Warszawa 1987.

[11] Le Corbusier, *W stronę architektury*, transl. T. Swoboda, Fundacja Centrum Architektury, Warszawa 2012.
[12] Le Corbusier, *Kiedy katedry były białe. Podróż do kraju ludzi nieśmiałych*, transl., Swoboda T., Fundacja Centrum Architektury, Warszawa 2013.
[13] Le Corbusier, *Urbanistyka*, transl. T. Swoboda, Fundacja Centrum Architektury, Warszawa 2015.
[14] Rabaça A. (ed.), *Le Corbusier, History and Tradition*, Imprensa da Universidade de Coimbra, Coimbra 2017, DOI : 10.14195/978-989-26-1338-3 (access: 30.06.2019).
[15] Marchwiński J., Zielonko-Jung K., *Współczesna architektura proekologiczna*, Państwowe Wydawnictwo Naukowe PWN, Warszawa 2014.
[16] Solla, I. F. *Le Corbusier: a French lesson on 'Murs neutralisants',* http://facadesconfidential.blogspot.com/2012/04/ (access: 30.06.2019).

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