Contemporary Architecture

Contemporary Architecture:

The Genesis and Characteristics of Leading Trends

^{By} Marta Tobolczyk





Contemporary Architecture: The Genesis and Characteristics of Leading Trends

By Marta Tobolczyk

This book first published 2021

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data A catalogue record for this book is available from the British Library

 $Copyright © 2021 \, by \, Marta \, Tobolczyk$

 $Cover \, Designer: Agata \, Tobolczyk$

All rights for this book reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner.

ISBN (10): 1-5275-7039-8 ISBN (13): 978-1-5275-7039-9

CONTENTS

Acknowledgements	viii
Abstract	ix
Introduction	1
PATH TOWARD MODERNITY	2
Notion of Modernity	2
Civilizational and social transformation in the Age of Enlightenment	2
Precursors of modern architecture at the turn of the 18th and 19th centuries	3
Progress of engineering as a challenge for architects	5
Dissonance between the engineering potential and the academic tradition	10
Concept of elementary composition	10
MODERNISM	13
Definitions	13
Characteristics	13
Leaders of Modernism	13
Genesis and context of the emergence of the modern movement	14
SEARCH FOR A NEW EXPRESSION IN ARCHITECTURE AT THE TURN OF THE 20TH CENTURY	15
Europe	15
United States – Louis Henry Sullivan and Frank Lloyd Wright	17
Avant-garde architecture in Russia; constructivism (1917–1932)	
Constructivism development	
Formation of modernism in 1911–1932	
Integration of arts, architecture, and craft with industrial production; Germany Deutscher Werkbund	25
The Achievements of the Bauhaus school	30
Leaders of the modern movement related to Bauhaus	32
Walter Gronius	32
Ludwig Mies van der Rohe	33
New concepts of form and space in architecture	33
Netherlands and De Stiil movement	33
International style	38
France and the accomplishment of Le Corbusier	
Le Corbusier's visions of a contemporary city	
International Congresses of Modern Architecture CIAM	
The Birth of Polish Modernism	45
Modernism after World War II	48
The Innovative Structures of Ludwig Mies van der Rohe	
Brutalism	
Search for greater expression of form and structure in the modernism of the 1960s and 1970s	
Mobility, repeatibility, and prefabricated technologies.	
Urban planning and mass housing after World War II	
Structuralism and the architecture of social participation	69
Megastructures of the future	75
Polish modernist architecture in 1945–1975	81
Housing	81
Architecture of social participation	
Public buildings	
CRITICISM OF MODERNISM IN THE 1960S	

Postmodernism	90
Definition	90
Characteristics	90
Leaders	
Cultural context	
Conceptual basics of Postmodernism	91
Theoretical foundations of postmodern architecture	
Postmodern Architecture	
Historicist currents of Postmodernism	
Critical regionalism	
Postmodernism in Poland	114
Characteristics of postmodern architecture	116
New Urbanism	116
The New Urbanists' visions of the humanized environment	118
Restoring control over the spontaneous sprawl of cities	
The Accomplishments of Dostmodernism	
Summary of a discourse of modernism versus postmodernism	
Summary of a discourse of modernism versus postmodernism	
HIGH-TECH ARCHITECTURE	
Definition	
Characteristics	
Leaders	
Genesis – Fascination with the industrial era and futuristic visions	
Features of High-Tech Architecture	
Flagship edifice – The Pompidou Center	
Social openness	
Flexibility and mobility	130
Is it high technology?	
Fco-Tech	136
FYPRESSIONISM	137
Expressionism in fine arts	137
Definition	
Chemataristics	
Example in analytication	
Expressionism in architecture	
Characteristics	
The state of expressionism	
The political and social contexts of the birth of expressionism	
Expression of glass application	
Various examples of Expressionist architecture	
Einstein Tower in Potsdam by Erich Mendelsohn	
The expressionism of Amsterdam's School in Netherlands	146
The occultism and architecture of Rudolf Steiner	
Expressionist architecture in modern Poland	
Neo-expressionist architecture after World War II	
Expressionist tendences in the 21st century	
DECONSTRUCTION (DECONSTRUCTIVISM) IN ARCHITECTURE	167
Definition	167
Characteristics	
Important events	
Outstanding architects	
Consist and context of the movement's beginning	
Theoretical assumptions	
The high of destruction	
First works	
I'll St WOIKS	
James Wines.	
Cordon Matta-Clark	
Peter Elsenman	
Development of deconstruction after 1982	
Parc de la Villette and the <i>Follies</i> of Bernard Tschumi	

Influence of constructivism and futurism	
Coop Himmelb(l)au	
Günter Behnisch	
Remment Lucas Koolhaas	
Zaha Hadid	191
Daniel Libeskind	195
Opening of new possibilities	
FOLDING IN ARCHITECTURE	199
Definition	199
Leading architects of the folding trend	199
From distraction to continuity	199
Theory of folding architecture	
Computational design and prefabrication	
Folding origami architecture	
NEW MODERNISM	
MINIMALISM	
Definition	214
Characteristics	
Forerunners and patterns	
Architects of minimalism	
Genesis of the idea of creative restraint	
Purism	
"Less is more" by Mies van der Rohe	
Minimalism at the turn of the 20th and 21st centuries	
Harmony of unity in the undivided whole	
Architecture of Tadao Ando	
Takashi Yamaguchi	
Álvaro Joaquim de Melo Siza Vieira	
Eduardo Souto de Moura	230
Herzog & de Meuron	230
Shigeru Ban	231
John Pawson	232
Alberto Campo Baeza	
Peter Zumthor	236
SANAA	
SUMMARY	
Bibliography	246

ACKNOWLEDGEMENTS

I would like to express my heartfelt thanks to everyone who contributed to the completion of this book by giving valuable advice and stimulating discussion as well as donating illustrations. Acknowledge for photographs and graphic materials: Archives of National Museum in Warsaw, Archives of PWN Publisher in Warsaw, Prior Samuel of the Trapist Order in Nový Dvůr, Patrycja Arasim, Dymitr Atanassow, Jacqueline Banerjee, Stefan Behnisch, Anna and Magda Bilskie, The Bogliasco Foundation, Carlos Coutinho Porta, Richard Dorrell, Leonardo Finotti, Thomas Flechter, Monika and Mariusz Gaworczyk, Jeff Goldberg/Esto, Krzysztof Helm, Philipp Hienstorfer, Justyna Janiak, Ignacy Kaim, Tomasz Kamiński, Konrad Kędzierski, Katarzyna Kosk, Janusz Kozakiewicz, Leon Krier, Kishō Kurokawa Architect & Associates, Martin Losberger, Jeroen Meijer, Veit Mueller, MykReeve, Tomio Ohashi, Mario Roberto, Duran Ortiz, Adam Pietrzak, Elizabeth Plater-Zyberk, Annick Prime-Margulis, Andreas Praefcke, Leah Rucker, Michael Ryan, Magda and Wojciech Tarczewski, Roman and Klaudia Siczek, Michał Stąporek, Franz Schneider, S. Schleifer, Filip Surowiecki, Hisao Suzuki, Przemysław Szymański, Agata Tobolczyk, Justinien Tribillon, Stefan Westrych, Paweł Wołejsza, Wiktor Wyszywacz, Derrick Tang, Peter Watts, James Newton Wines, David Zwirner, and many others to whom I owe my thanks and appreciation. My special gratitude for creative collaboration and critique goes also to Anna Bułyszko-Dybczyńska, Teresa Woźniak, and Danuta Czudek-Puchalska. I will keep in my best memory the people who contributed to this book but are no longer with us: Stanisław A. Tobolczyk, Lech Kłosiewicz, Krzysztof Strebeyko, Lewis Lubka and Stanisław Niemczyk.

ABSTRACT

This book presents architecture in the 20th and 21st centuries.¹ The author has attempted to explore the origins and characteristics of the leading architectural trends of the period against a setting of major social and technological transformations. When explaining the phenomena related to the development of architecture, she expressed respect to the approaches to architecture of some distinguished authors, whose terminology and interpretations established foundations of theories of contemporary architecture. Whilst stripping away myths and exaggerations, the author tried to present the complex picture of contemporary architecture in a simple and honest way. The book is intended to be a part of series; this first volume discusses the currents of modern and postmodern architecture and the second will contain an overview of green and organic architecture as well as evolutionary and morphogenetic trends.

¹ The Polish version of this book was recently published in Warsaw: Tobolczyk, M. Architektura współczesna. *Geneza i charakterystyka wiodących nurtów*. Oficyna Wydawnicza Politechniki Warszawskiej. http://www.wydawnictwopw.pl/index.php?s=karta&id=3256/

"When forms break down, they are replaced by fresh ones that have existed all the time but only now come to the fore." —Erich Mendelsohn

INTRODUCTION

In the 20th century there were two significant events in architecture. The first event was the birth of the modern avantgarde movement, which built a system of concepts and means of expression for architecture compatible with the spirit of the Enlightenment and the level of industrial civilization. It occurred in the period 1914 to 1930, following the technological, social, and intellectual changes in the preceding two centuries in Europe and North America along with industrialization. The second event with social implications was the emergence of the postmodern movement, questioning and denying the doctrine of modernism, in the 1960s to the 1980s. Postmodernism appeared when the means of expression used by early modern avant-garde leaders lost its power and meaning in the new political and socio-economic context of developed capitalism. The discourse around modernism versus postmodernism carried out between the 1960s and the 90s initially provoked high emotions.² Now we approach this discourse from a greater distance, perceiving it as a natural fluctuation of contradictory tendencies - breaking the existing order and its opposite that strives to meet the established tradition. This book is an attempt to present the origins and characteristics of the leading trends of architecture of the current and the previous century in as objective manner possible against the background of these changes. In the interpretation of these changes, the author uses terminology and concepts initiated by architects and theorists (such as Otto Wagner, Frank Lloyd Wright, Le Corbusier, Bruno Zevi, Siegfried Giedion, Reyner Banham, Peter Eisenman and Robert Venturi) that became an enduring part of architectural vocabulary and theory content. This book discusses the currents of modern and postmodern architecture and the second one will contain an overview of green and organic architecture as well as evolutionary and morphogenetic trends.

 $^{^2}$ Jean Baudrillard, one of the most radical postmodernists, discusses the birth of postmodernism in category of the second revolution: "that of the Twentieth Century, of postmodernity, which is the immense process of the destruction of meaning equal to the earlier destruction of appearances. Whoever lives by meaning dies by meaning" ([Baudrillard 1984:38–39] in Ashley 1990).

PATH TOWARD MODERNITY

Notion of modernity

Intuition suggests that each generation has its own understanding of modernity. Generally, however, the philosophical sense of the term (Eng. Modernity; Fr. Modernité) is related to the rationalism of the Enlightenment (1688–1789), the primacy of reason and individualism and progress over traditional values. The commencement of postmodernism is connected to the failure or rejection of the concept of modernity. The author of the concept of postmodernism, French philosopher and literary critic Jean-François Lyotard, called the father of this movement, explains that "modernity, perceived as the epoch of progress, assumed a constant supply of new technical solutions, expecting at the same time, each of them to be verifiable in the context of the universal rules of the truth".

By binding modernity with the idea of progress, usefulness, and truth, we reach the classic triad of Plato, uniting *truth, beauty, and goodness*, the foundation of European culture. Recognizing that truth in the case of architecture is the sincerity of its expression as a response to the widely understood environmental and civilizational context, we come to the belief that modernity can be considered a timeless concept, meaning independent of the time and place of the attitude of the avant-garde. The question of truth and falsehood can be discussed in architecture in moral and aesthetic terms. For millennia, the creators of architecture used real or borrowed forms, depending on many complex circumstances. No surprise, then, that the Polish outstanding philosopher Władysław Tatarkiewicz considers Aristotle and Cicero as modern aestheticians. Referring to the way of conceiving art, he distinguishes between the classic and modern understanding of its principles. Stressing the ambiguity of the second, Tatarkiewicz defines as modern "either 1) any understanding of the art that occurred nowadays, or 2) only this understanding, which was the specific creation of new times and differed from the understanding of the past, and in particular, of the classic meaning". These formulations represent modernity as a timeless phenomenon.³

In this book I use the historical definition of modernity that refers to the place (Europe, North America) and the time (the early 20th century) of the emergence of the new doctrine in architecture and urban planning, which was to meet the needs of a democratic society in the industrial era. To examine the ontogenesis of this concept, however, we must go back to the 18th century, when the system of values of the Enlightenment was created.

Civilizational and social transformation in the Age of Enlightenment

By the mid-18th century, the great economic and cultural systems of the baroque had lost their power. When the social and industrial revolution confirmed the collapse of the feudal world built on land ownership, conditions were founded for a new worldview. A group of outstanding researchers under the leadership of René Descartes and Isaac Newton created a scientific and philosophical basis for the oncoming civilizational transformation. Descartes was a French philosopher, mathematician, and physicist, one of the most distinguished scholars of the 17th century. He wrote *Discours de la méthode* (*Discourse on the Method*, 1637), in which he developed the basic rules for rational and strictly scientific thinking, thus creating the foundations for the Enlightenment. Isaac Newton, a British scientist in the early baroque era, presented in his work *Philosophiae naturalis principia mathematica* (1687 r.) the law of universal gravitation and the laws of motion underlying classical mechanics. The accomplishments of both geniuses led to the phenomenon known today as the *scientific revolution*.⁴ In the climate of the Cult of Reason and rationalism, Enlightened Man emerged, representing a new system of values and oriented in current cultural and philosophical currents. He disassociated from religion, the prevailing morals, and conventions and had respect for and trust in science. He combined a curiosity of the world with tolerance and openness to change and progress. He showed freedom of thinking and the ability to conduct a witty conversation.

The development of science, and then the Industrial Revolution in Great Britain, which was the world's largest colonial empire in the 18th century, formed the economic, scientific, and technical foundations for a new social formation – capitalism. It was based on different forms of ownership and distribution of goods than the feudal system and was strengthened thanks to the mass industrial production made possible by the cheap labour provided by the peasants residing in the cities. Inventions and the introduction of new technologies dynamized the development of cities in Europe and North America. There was a resulting increase in employment and the emergence of a new social class – industrial workers.

This dramatic breakthrough, the total change in the social system and the construction of a new economy, was accompanied by turbulent events. A series of bloody revolutions and wars swept through Europe and North America from

³ W. Tatarkiewicz, Droga przez estetykę, PWN Warszawa 1972, p. 289.

⁴ The term *scientific revolution* was introduced by American physicist Tomas Samuel Kuhn (1922–1996). The scientific revolution relied on a complete change in theory and the fundamental methodological and philosophical assumptions of the given science. The new methodological system developed by Descartes and Newton, based on reductionist principles, is called (after T. S. Kuhn) the mechanist paradigm.

the 18th up to the 20th century: the French Revolution, the Napoleonic Wars, the Spring of Nations, World War I, the Russian and German Revolutions, the American Revolutionary War (1775–1783), and the Civil War. These painful confrontations also had positive effects, however. Some legal acts supporting processes of democratization were already established in the 18th century both in Europe (the Proclamation of the French Republic of 22 September 1792) and in America (the Declaration of Independence of 4th July 1776 and the partial abolition of slavery in the American Constitution).

In the era of accelerated industrialization, council housing developed in England. When shoddy privately built worker settlements became a source of mortal diseases, state subsidies were provided to improve the catastrophic hygiene in cities. This was the first attempt to counteract the pathology of wrongly understood commercialism. It seems that the social transformation leading to democratization was a significant driving force in the modern world, which shouldn't be ignored. At the background of these complex transformations were new conditions for the transformation of objectives and means of expression in architecture and urban planning.

One of the indicators of the democratic transformation was initiated in England in the mid-19th century by the cooperative movement, quickly taken over by the developed Western countries. Small manufacturers were only able to oppose the capitalist power when acting collectively so they formed cooperatives that produced and built cheaper, mainly to meet the needs of members. The cooperatives, founded in the Netherlands in the 19th century by the bourgeoisie, were joined by the workers assigned to construct housing communities. To this day, the state-subsidized social housing societies are the most efficient sources of low-cost rental housing. They represent more than 50% of the total housing stock.

Precursors of modernist architecture at the turn of the 18th and 19th centuries

As a result of these changes, conditions were suitable for defining an Enlightenment paradigm in the art of building at the end of the 18th century. The predictive signs of the modernist movement in architecture, which was based on pure abstract forms and simple geometric volumes, were manifested in the utopian and revolutionary projects of two neoclassical architects – Claude Nicolas Ledoux and Étienne Louis Boullée. With full awareness, these architects created visions of architecture consistent with the ideas of the Enlightenment era. In the French Revolution both authors promoted egalitarianism even though they had previously used the protectorate of the monarchy (Ledoux served the king of France Louis XV; Boullée was the court architect of King Frederick II of Prussia).

Perceived today as among the most original creators in the 18th century and the precursors of modern architecture, they proposed reform in the spirit of the philosophy of Jean Jacques Rousseau (recognized by Robespierre himself) while applying the monumentality of enlightened absolutism. Ahead of their time with their modern functional approach and operation of pure geometric blocks, both architects used the design patterns and philosophies developed in ancient Greece and Rome (among others the concepts of Plato and Vitruvius, and even of the earlier ancient Egyptian architecture, discovered anew for European culture during the Napoleonic Wars).



Fig. 1 Claude Nicolas Ledoux: Project of the ideal industrial city Chaux (Saline Royal d'Arc-et-Senans, France 1775 - 1779). The world's first model of an ideal industrial city with a centrally located industrial plant and the seat of the supervisor. A regular plan based on pure geometry forms a spatial order around industrial structures, representing a new system of economic and social values but inherent in part in the feudal system.



Fig. 2 Claude Nicolas Ledoux (1736–1806): River Inspector's House, France (1804). The abstract manipulation of basic geometric volumes was a revolutionary act that broke down traditional values in architecture to pave the way for the modernist avant-garde.



Fig. 3 Étienne-Louis Boullée: Newton's Cenotaph, France (1784). The ball-shaped (dia.150 m.) structure with the symbolic tomb of Newton at the base. Boullée expressed many metaphors. He related the symbolism of the relationship between the Earth and the cosmos with the ancient idea of the central world's axis (*Axis Mundi*) – a liaison of temporality and immortality, earth and cosmos, the human and the supernatural, with the metaphor of light carrying enlightenment and knowledge.

C. N. Ledoux presented his theories of urban planning in the project of the ideal city of Chaux (Saline Royal D'ARCet-Senans), which was partly constructed in the years 1775-1779, and in the treatise *L'Architecture considérée sous le rapport de l'art, des moeurs et da la législation* (1804 R). In Chaux, he created the first, rather naïve, model of a city for the industrial era, which glorified industrialization and capitalism. This vision strongly diverges from the spontaneous and extremely compact workers' housing complexes that began to emerge in the landscape of industrial cities. The harmoniously composed Chaux, based on pure geometry, reflects the social hierarchy of a new system of economic values but lies in the feudal system. The spatial composition, with the centrally located Royal Salt Production plant and the supervisor's house, seems to represent a country farm rather than the city. Public buildings for specific educational and social purposes (school, theatre, the so-called House of Reconciliation – for moral renewal) were situated along the ring road in the green, with an intention to implement the values of the Enlightenment.

The second architect who contributed to the modernist avant-garde movement, diverging from the traditional classicist patterns of architecture, was Etienne-Louis Boullèe (1728–1799). Boullée tried to express the grandeur and magnitude of the world through the use of basic platonic or geometric solids in visionary projects of monumental edifices. He also paid homage to the ancient philosophers and builders, admiring the mastery of the early Egyptians in operating a synthetic form to express the idea of the Absolute. Boullée transferred the power of expression in geometric abstract forms, which he discovered in ancient works, to the new concept of a monumental building, maintaining the tranquility and the ideal beauty of classical architecture in hidden expressions. In his famous essay "La Théorie des corps", Boullée studied the geometric characteristics of form and the strength of its influence on the senses, attributing to the "innate" the symbolic properties of the cube, pyramid, cylinder, and sphere, treating the latter as a perfect form.

This conviction was expressed most strongly in the project Isaac Newton's Cenotaph in 1784. With its dominant sphere of approximately 150 metres in diameter, which would contain the symbolic tomb at the bottom, Boullée symbolized not only Newton's achievements but also the relationship between Earth and the cosmos by expressing the ancient idea of the central world axis (*Axis Mundi*) – and connecting temporality and immortality, earth and space, the

human and the supernatural, with the metaphor of light carrying enlightenment and knowledge. He transposed the symbolism of the Enlightenment on the plastic play of light and shadow, which was later developed into the notion of *pure form* created by Geoffrey Scott (1914): "Architecture, simply and immediately perceived, is a combination, revealed through light and shade, of spaces, of masses, and of lines. These few elements make the core of architectural experiences", transferred then by Le Corbusier to the famous definition of architecture as a game of light and shadow on cubic forms.

In retrospect, both the views and the works of C. N. Ledoux and E. L. Boullèe seem irrational and utopian. Nonetheless, the innovative, even revolutionary attitude of these architects was the first step in the breaking down of the traditional values in architecture to pave the way towards modernity.

Progress in engineering as a challenge for architects

The innovations and the development of engineering that gave an impetus to the Industrial Revolution also prepared the ground for revolutionary changes in the field of construction. The progress of mass melting technology in metal casting and the invention of the industrial steam machine by James Watt in 1763 played a special role. The introduction of iron and steel in construction systems made it possible to overcome the existing limitations in covering large spans and to build taller buildings. The first breakthrough on the way to mastering the new engineering techniques took place in the 18th century. In 1779, the world's first cast iron bridge was erected on the Severn River in Coalbrookdale, the United Kingdom (architect Thomas Pritchard). This innovative structure used cast iron from the Coalbrookdale foundries nearby.

It was a three-span arched bridge with a total length of 60 m and a median span 30.7 m, whose knots were made by using the carpentry jointing details typical for wooden construction techniques. The success of the bridge over the Severn River, which survived several floods, heralded a century of further development of cast iron and steel structures in Europe and America. An important milestone in this innovation relay was the first bridge suspended on steel ropes, which was raised across the Rhône River in Tournon, France in 1824. In America another impressive structure came into existence – the Brooklyn Bridge connecting Brooklyn with Manhattan in New York (1870–1883), designed by John Augustus Roebling, a German-based construction engineer and architect.

The Crystal Palace built for the Great Exhibition of the World 1851 in Hyde Park, London, the iron Garabit Viaduct from 1880–1884 over the Garabit Valley and the Truyère River near the village of Ruynes-en-Margeride in the Cantal department in France, designed by Gustavus Eiffel (a length of 565 m, spans of 165 m, and a height of 80 m), and the 300 m-high Eiffel Tower, erected for the World Exhibition in Paris in 1889 are further examples of early innovative architecture.



Fig. 4 The world's first cast-iron bridge on the Severn River in Coalbrookdale, UK (1779, architect Thomas Pritchard). The 13.7 mhigh bridge was constructed from five sectional, cast-iron arched ribs that span 30.7 m. The prefabricated iron elements were produced in Darby's factory in Coalbrookdale and mounted on the spot, which reduced construction time. There was also no need for the longterm closure of an important shipping route.

Fig. 5 The Brooklyn Bridge in New York, connecting Brooklyn with Manhattan (1870–1883). The first suspension bridge on steel ropes in America. More specifically, it is a hybrid cable-stayed/suspension bridge. It was designed by the company of construction engineer John Augustus Roebling from Trenton. Photo: Agata Tobolczyk.

Path Toward Modernity



Fig. 6 a. The exterior view of the Crystal Palace at the Great World Exhibition 1851 in London. **Fig. 6 b.** Interior of the Crystal Palace. The slenderness of the cast iron construction, the immensity of free space, and the transparency caused admiration and consternation from visitors who could not relate to the architecture the value systems in force. Lothar Bucher expressed this in a sentence: "We see a delicate grid of lines without any clue by means of which we might judge their distance from the eye or the real size".³

Of the above-mentioned innovative works, the British Crystal Palace was undoubtedly of the greatest importance for the further development of architecture. It is a phenomenon that marks the influence of industrialization on the shaping of form and public space with the help of new industrialized production methods and construction technology, which, in addition, initiated a different beauty. The premonition of a new era of design was expressed at the opening of this unprecedented building of unparalleled scale (length 564 m, width 138 m, and nave height of 42 m), constructed of cast iron, wood, and glass. This is confirmed by the statement of German politician and writer Lothar Bucher: "The Crystal Palace is a revolution in architecture from which a new style will date".⁵

It was designed by Joseph Paxton, who was an experienced greenhouse constructor. His tender was selected for its distinctive lightness and relatively low cost. Its chief asset was the fact that its repetitive structure enabled the use of the prefabrication process, which enabled it to be quickly dismantled and reassembled elsewhere. Discarding the patterns of Victorian architecture, Joseph Paxton abjured elements of decoration. The three-exhibition building with the main nave of barrel glass supported on semi-circular laminated-wood girders and with galleries in the lateral aisles was a simple response to the specific function and short exposure time.

The only decorative elements of this transparent structure were the colours used: the interior was painted white, red, blue and yellow, whilst the outer colour was cyan. The construction of such a gigantic, completely glazed building was possible thanks the progress made in flat glass casting techniques in the UK at that time. The use of a modular construction system and glazed panels, based on the maximum dimension of a 1.2 m glass pane, allowed the structure to be built at the fast pace of 10 months. The structure system was designed by using only four types of carrier beams of 7 m up to 22 m. The cast iron pillars, bolted on, were used simultaneously to drain rainwater. Industrially produced posts and beams were tested on the construction site for strength with hydraulic presses, and then set in place by cranes. Thanks to its lightness and transparency, the edifice seemed to be infinitely large, beyond past sensual experiences. In its impressive enormous interior, natural trees and statues emphasized its splendour, manifesting the triumph of mankind over nature. The Crystal Palace, recognized at that time as a great success and architectural wonder, was a triumph of engineering, giving a special rank to the new event – a world exhibition. The Crystal Palace aroused the imagination of artists, architects, and writers in the first three decades of the 20th century and inspired further creative exploration.

The 1851 London Exposition, recognized as the first truly international exhibition,⁶ launched a period of world rivalry in all areas of invention and production. An example of such competition in technical and architectural innovation was the world exhibition in Paris, 1889, and the Eiffel Tower, which was especially erected for this exposition to demonstrate to the world not only the level of French engineering knowledge but also the technical possibilities of the epoch.

The construction of the Crystal Palace emphasizes an important moment of creation of a new type of large-space building complexes for short-term exposure, erected by methods of industrial prefabrication. These were the temporary structures of world exhibitions that distinctly revealed the features we identify with modernity, namely, variability, mobility, and lightness in a structure obtained in repetitive mass production, and values such as unity of function, structure system and space, open plan, and transparency.

The scientific and industrial revolutions in Europe were accompanied by similar transformations on the American continent. In the economic boom of the 1880s in America, the first ten-floor modern skyscraper appeared – the Home Insurance Building in Chicago (1883–1885), designed by William Le Baron Jenney. It was built with the iron skeleton

⁵ Bucher, L, Kulturhistorische Skizzen aus der Industrieausstellung aller Völker. Frankfurt a. M. 1851, p. 174.

⁶ Earlier exhibitions took place in 1751 and 1798 in London as well as in 1802 in Paris.

system, complemented by the first steel beams to support the masonry shell of floors and walls, thus marking the beginning of a new era in the field of skeletal engineering structures, further developed by a group of architects who became part of the so-called "Chicago School"⁷ of skyscraper design.



Fig. 7 Ten-storey Home Insurance Building in Chicago (1883–1885), designed by William Le Baron Jenney, one of the world's first skyscrapers. The cast iron frame with steel beams released the outside walls from the load-carrying function, which allowed the replacement of the traditional windows by glazed curtain walls suspended on the steel frames, and inside the building gave the freedom to shape each floor plan. Source of photo: Home Insurance Building.JPG, Wikipedia.

Fig. 8 The Fair Store in Chicago (1890–1891). Structure detail showing a combination of cast iron columns and steel beams covered with concrete fire-protective coating.

William Le Baron Jenney is considered the creator of the "school". He was in fact a brilliant engineer and architect who completed his comprehensive education at the École Polytechnique and the École Centrale des Arts et Manufactures (where he studied at the same time as Gustave Eiffel). In the favourable conditions of the American economy, he was able to use his knowledge, talents, and abilities to achieve spectacular success in both engineering and business. Jenney played a similar role to Peter Behrens in Germany around 1910 and August Perret in France. Such eminent architects and engineers as Louis Sullivan, Daniel Burnham, William Holabird, and Martin Roche gained their expertise and achieved high status after professional training in Jenney's office. Thanks to their initial collaboration with him, they became central figures of the Chicago School. These architects and engineers were the first to implement innovative technologies based on the iron and steel skeleton and created the prototype of the high-rise offices and commercial buildings in America.

⁷ The term "Chicago School", introduced by Carl W. Condita in the book *The Chicago School of Architecture: A History of Commercial and Public Building in the Chicago Area, 1875 – 1925* (University of Chicago Press, 1964), raises controversy among American architecture critics. They consider it unreasonable to link the school to a group of creators of high rise commercial and office buildings who represented different stylistic features.



Fig. 9 Marquette Building in Chicago, designed by architects Holabird and Roche and completed in 1895. Simple orthogonal façades were divided by the rhythm of repeated vertical avant-corps, and horizontal sill lines, reflecting the spacing of the steel-bearing structure. Photo: Roman Siczek

The experimental use of lighter steel beams instead of iron ones, which took place for the first time in the headquarters of the Home Insurance Building in Chicago, inspired the search for a new way of shaping space. The innovative system, despite the higher costs, had enormous advantages. It had better fire protection parameters and thinner walls. The use of curtain walls in the structural skeleton freed the walls from the load-carrying function, which gave the possibility of larger glazing in the exterior façades and considerable freedom to shape a more open floor plan. Making use of natural light was of great importance when electrification was just beginning.

The dynamic development of new technologies using cast iron, steel, and glass became a challenge for architects. The favourable economic conditions in the late 19th century in the US gave rise to an unprecedented pace of building structures with new features (large office and commercial centers) on a gigantic scale. At the same time, with the current canons of architectural art, the modernization of the aesthetic expression of erected structures could not be done immediately. The simplification of the structure at the beginning was nothing more than abandoning the monumental neoclassical forms and reducing the number of details and ornaments. A special bravery was needed to demonstrate a more abstract approach that would extract the pure beauty of the skeletal structural system. Such boldness, supported by the conviction that the synthetic treatment of the structure elements is a value in itself, has been gained by only a few. William Le Baron Jenney was one of them. A very pragmatic person, he prioritized the economics, simplicity, and understanding of construction. His conviction, expressed in numerous publications, that we can speak of aesthetic values only when the established practical objectives were resolved in a satisfactory way would become one of the tenets of the doctrine of the next century's modernist functionalism. His views were expressed in the design of buildings; for example, in the Leiter Building I in Chicago, 1879, in which he provided the modular system of vertical pillars and accentuated wide window openings on the façade while reducing the decoration to a minimum.

The strongly exposed rhythm of the structural skeleton became a new means of expression in architecture. This pattern, initiated by Jenney, was followed by other architects. The tendency to minimize ornaments and reduce forms to the rhythm of vertical ryzalits and the horizontal lines of sills was strongly expressed in the Marquette Building in Chicago 1894, designed by architects Holabird and Roche. The process of further simplification bringing the aesthetic expression of the façade to the rectangular grid of divisions, which was initiated at the end of the 19th century, was continued later by Mies van der Rohe in the "Second Chicago School" after the invention (by Alastair Pilkington in 1952) of float glass.

Concrete was another essential material, after iron, that set the stage for the modernist movement in architecture. The composite building material, formed by mixing binders (cement), filler (aggregate) and additives to give the desired characteristics, was already known and appreciated in ancient Assyria and Rome. However, it came back into use only in the 19th century when steel reinforcement was added to improve its properties. The combination of concrete, which resists

compression forces, with steel, which resists tensile stresses, produced a new material – reinforced concrete, which increased the possibility of building different types of long-span structures. Reinforced concrete was invented by French gardener Joseph Monier, who patented the reinforced flowerpot (1867) he produced by inserting a wire mesh into a mortar shell. The possibility of using this composite for construction purposes was demonstrated at Expo 1867 in Paris. It was also Monier who patented new building materials – a concrete slab (1869) and the reinforced ceiling beam (1878). He also designed and built a reinforced concrete bridge for Castle Chazelet (1878). The importance of reinforced concrete for architecture is so significant because it makes it possible to erect structures of arbitrary, even sculptural shapes at a lower cost than with steel. It is no wonder that from the end of the 19th century to the present, it has played an extremely important role in construction.



Fig. 10 Lombartzyde in Belgium (1879). Innovative construction system of reinforced concrete (Fr. béton armé), patented by François Hennebique in 1892, combining separate elements of construction, such as the column and the beam, into a single monolithic element.

The self-educated French engineer François Hennebique launched the era of the mass use of concrete in construction in the late 19th century. He saw Monier's reinforced flowerpot at the World Exhibition in Paris in 1867 and experimented with the use of concrete in a protective coating of cast iron at the construction site in Lombartzyde, Belgium (1879). As a result of these experiments, he concluded that it would be simpler and cheaper to replace the skeleton of iron with iron bars inserted in the poured concrete. He invented a composite material by combining concrete and iron, which he described as "béton armé", and patented it in Belgium in 1892.⁸ He devised an innovative construction system of reinforced concrete connecting such separated elements as the column and the beam to a monolithic element. Hennebique applied this new technology to a bridge he designed in Viggen, Switzerland (1894). The patent, which resolved the problem of the connection between a column and a beam, heralded an era of the application of the reinforced concrete skeleton, initially referred to as Hennebique's system in architecture. Hennebique's large construction company thrived, completing 7000 projects between 1892–1902 and 2004. However, only in the projects of the famous French engineer Auguste Perret did the reinforced concrete skeleton take on the characteristics of a noble architectural medium.

The development of technology expanded the technical possibilities in architecture. The introduction of concrete, cast iron, steel, and glass constructions revolutionized building construction and architecture in that it was possible to build taller structures and overcome larger spans. However, this was not the most important thing. Development in architecture is not just about technical progress. As technical progress developed, the scale of perceiving problems evolved, expanding the potential of human imagination. It was now possible to create designs on a new, previously unimaginable scale, going beyond the former limits. These new potentials raised admiration, surprise, and sometimes consternation, especially because the academic tradition of aesthetic values did not form an intelligible comparative base for these new aesthetic perceptions. This is best expressed by the reflections on the Crystal Palace during the World Exhibition in 1851 in London. Lothar Bucher articulated this in a sentence,

We see a delicate grid of lines without any clue by means of which we might judge their distance from the eye or the real size. The side walls are too far apart to embrace in a single glance. Instead of moving from the wall at one end to that at the other, the eye sweeps along an unending perspective which fades into horizon. We cannot tell if this structure towers a hundred or a thousand feet above us, or whether the roof is a flat platform or is built up from a succession of ridges, for there is no play of shadows to enable our optic nerves to gauge the measurements.⁹

⁸ The 1892 patent was annulled in 1903, granting Monier precedence in the invention of reinforced concrete (patent 1878). http://structurae.net/persons/data/index.cfm?id=d000016.

⁹ Giedion, S., 1969, pp. 243-44.

Therefore, in architecture not only do building techniques evolve but also concepts, spatial schemes, and ways of solving design problems. This phenomenon found a definite manifestation in the transformation that occurred in the architecture of the early 20th century.

Dissonance between the engineering potential and the academic tradition

The development of innovative technologies opened up undreamt of possibilities for the creation of space and building in architecture. However, despite the enormous transformations in the economic and social spheres of highly industrialized countries, the architecture of the late 19th century still used the means of expression deriving from previous epochs. With the ubiquitous eclecticism of historical styles it had lost creative character and authenticity.

Many architectural historians discuss the problem of paradoxical dissonance between industry, academic tradition, and everyday life. Well, the dynamic development of industrial cities and changes in the way of life in the machine era required a definite change in the expression of architecture and art. In a strongly hierarchical society, the principles adopted for the construction of bridges and factories could not be applied to prestigious public buildings, and even less so in the private residences of wealthy entrepreneurs. In addition, the academic traditions developed in previous epochs guarded the classical orders of architecture. Such an attitude was shared by the majority of professional and cultural elites.

The establishment of 19th-century engineering as a distinct discipline from architecture, confirmed by the opening in France of the L'École Polytechnique, was a sign of progress. On the other hand, the exclusion of structural and technological problems from the area of architecture, and the detachment of academic teachers from the practice, led to an ossified system of teaching focused on the problems of composition and the harmony of forms and proportions. The L'Ecole des Beaux-Arts in Paris, the most influential architecture school in Europe at the turn of the 19th and 20th centuries, had a strong impact on design practice. It dictated quality standards and determined the canons of beauty. Meanwhile, the architectural design process was brought back to the development of plans with multi-axially symmetrical patterns of abstract but unfunctional elegance.¹⁰ A few such designs, for example, the prestigious Prix de Rome National Bank project by French architect Tony Garnier, a graduate of L'Ecole des Beaux-Arts, awarded in 1899, show how far the teaching in this university corresponded with the requirements of the industrial era.

The confining of an academic world to its own circle, isolated from the technique, led in the 19th century to a clear division between *the art of decorating* and *art of building*. This was reflected in surprising definitions, such as by Gilbert Scott: "Architecture is unlike regular construction in that it is a decoration of the construction" and Edwin Lutyen: "Architecture starts where the function ends"; "Unlike regular construction, it is a decoration of the structure"; "(it) starts where the function ends."¹¹ The effects of such a division were evident in the superficiality of the architecture of the 19th century – the insincere decorative appearance, the disappearance of the relationship between the façade and the structure, the interior and the exterior, and the structure and the form; generally, the destruction of the organic traits of buildings. Reducing the tasks of architecture to mere aesthetics decreases the scope of the problems addressed to style issues.

Concept of elementary composition

The academic textbooks from the turn of the century also confirm the isolation of academic circles. Professor Julien Guadet emphasizes the importance of composition in his monumental book *Éléments et théorie de l'architecture* in which he describes how to match the separated elements of a building to a regularly established plan. Guadet writes

To compose is to make use of what is known (ce qu'on sait). Composition has materials, just as construction has, and these materials are, precisely, the Elements of Architecture. (...) Nothing, to be sure, is more engaging than composition, nothing more seductive. It is the true realm of the artist with no limits or frontiers, but the impossible. What is it to compose? It is to put together, weld, unite the parts of a whole. These parts, in their turn, are the Elements of Composition, and just as you will realise your conceptions with walls, openings, vaults, roofs – all elements of architecture – you will establish your composition with rooms, vestibules, exits and staircases. They are the Elements of Composition.¹²

¹² Guadet, J. Éléments et théorie de l'architecture, tom II/ks.VI, Librarie da la Construction Moderne, Paris 1901.

¹⁰ Banham, R., p. 19.

¹¹ First definition by Sir George Gilbert Scott (1811-1878), the second by Edwin Lutyens (1869–1944) according to Biegański, P. *Architektura. Sztuka kształtowania przestrzeni*, Wydawnictwa Artystyczne i Filmowe Warszawa 1974, p. 26.

https://archive.org/stream/lmentsetth02guaduoft#page/184/mode/2up, after Banham, R. *Theory and Design in the First Machine Age*, second edition, Praeger Publishers Inc., New York 1970, p. 20.



Fig. 11 Plan of the National Bank, awarded the prestigious Prix de Rome Prize in 1899. The principle of elementary composition was perfectly developed in this project by French architect Tony Garnier. Photo Source: http:///2.bp.blogspot.com/ iMq2hlSrpE8/Rm4arDARAfI/AAAAAAAAAAAAPo/BQ zWHtJ3uc/s1600/garnier- prix.jpg

The author then explains the process of composing, which is in stages: small structural and functional elements (architecture components) are combined into larger functional spatial units (composition elements) that comprise the entire structure. Relegating composition as a parent task of the architect did not in any way ignore the matter of progress in the field of construction. Conversely, Julien Guadet emphasizes his powers and progressivism, using the titles of professor and construction engineer by his name on the title page of the said work. The composition of the elements of architecture has become weapon in the competitive activity of "ordinary" building engineers with a higher rank of artistry and humanistic values – secret knowledge available only to narrow elites of acquainted architects. As the author of the academic textbook, Julien Gaudet presents himself as a cosmopolite. He presents examples of architecture from different countries, eras, and cultural circles, including Arabic Islam, treating all equally and looking for beauty and patterns for modern mimetic creation. He does not emphasize the problem of symmetry as he discusses the architecture of various types of objects, both monumental and residential in various aspects – from utilitarian and formal to decorative.

Although within the two architectural formations – classicism and modernism – there were different design methods and the classical harmony of the symmetrical plan put form above the utility requirements, the Gaudet principle proposes that each function corresponding to a specific, separate spatial unit, clearly marked in the block of the building, became a feature of the progressive architecture of the early 20th century.¹³ For example, Walter Gropius followed the principle of elementary composition as part of his teaching in the Bauhaus school and in his design of the new Bauhaus school building in Dessau (1926).

On the way towards modernity, academicism played two roles. On the one hand, it applied a brake on progress in architecture. It appeared that it was easier to adapt new materials and technologies to existing aesthetic standards and styles than create new forms and spatial patterns adequate for the industrial age and the machine era. Cast iron was the only new instrument, as it enabled the design of eclectic and pretentious façades, to satisfy the unfussy bourgeoisie or pseudo-monumental edifices reminiscent of the imperial past.

This new tool, through its use, has brought naturally restored forms to the functions of false façades.¹⁴

On the other hand, academicism held traditional values that avant-garde modernists, educated in classical tradition, tried to adapt to new materials, forms, and goals.

The feeling of change already appeared in the mid-19th century when the accelerated progress of industry signalled ever more clearly to the architects that their privileged position was threatened and their means of expression old-fashioned. In the architectural writings of the time, there was a series of statements announcing the coming breakthrough.

¹³ Ibidem, p. 21.

¹⁴ Giedion, Przestrzeń, p. 211.

The new architecture that brings us out of the barren past and the servile of copying is what we all demand and what the people are waiting for. (...) Mankind will create a completely new architecture derived from its time precisely at that moment in which new methods created by the industry are used. The use of cast iron allows and contributes to the wider use of many new forms; this is evident in the railway stations, the hanging bridges and the orangeries' arches. ¹⁵

One of the initiators of the renewal of architecture was Henri Labroust, a graduate of the L'École Royale des Beaux-Arts. He opposed the teaching methods used there and so in 1830 founded his own studio and architectural school, which provided an education based on rational principles. Ahead of the assumptions of functionalism,¹⁶ Labroust shared with his brother some thoughts on teaching in a letter.

I often repeat to them (students) that art has the power to make everything beautiful but I insist that in architecture the form must always match the function it is intended for.¹⁷

However, on the threshold of the 20th century, neither Europe nor America was ready to develop the doctrine of modernism, which was based on two fundamental principles – a departure from historical styles and, consequently, acceptance of *fitness for purpose* as a criterion of value.¹⁸ Only the collapse of the economic and social systems, as a consequence of the outbreak of World War I and the Russian Revolution, gave the impetus needed to take on its challenges to continue engineering development and construction techniques which started 150 years ago.

¹⁵ Poet Théophile Gautier, La Presse, 1850.

¹⁶ Paul Souriau may be considered a precursor of functionalism based on this sentence: "Each thing is perfect in its own genre when it suits its purpose [...] There can be no conflict between what is beautiful and what is useful. The object is beautiful when its form is an obvious expression of a designated function". Souriau, P., (red. Félix Alcan), *La Beauté rationnelle*, Paris, w: *Bibliothèque de philosophie contemporaine*, 1904, 375-393, translated from French by the author.

¹⁷ From his letter to his brother (November 1830); after Giedion, S., Przestrzeń, czas, p. 249.

¹⁸ John Ruskin wrote: "The nobility of each building depends on its special fitness for its own purposes; and these purposes vary with every climate, every soil, and every national custom". In: J. Ruskin, *Stones of Venice*, London: Smiths, Elder and Co. 1851, p. 194. Giedion, S., op. cit, p. 323.

MODERNISM

Definitions

Just as the concept of modernity can be understood in different ways, there have been many definitions of modernism in the literature and art of various countries in the late 19th and early 20th centuries.¹⁹ Its meaning evolved over time, causing many misunderstandings and controversies.

- Modernism (from Fr. *moderne*, Eng. *modern*) means tendency in architecture, encompassing many different, sometimes opposing currents (from functionalism to expressionism), developing from the beginning of the 20th century and dominant in the years 1918–1972. It was against copying historical styles and was founded on a new creative method based on the principles of functional design and the manipulation of abstract forms, space, and light, as well as on the rational use of materials such as steel, glass, and concrete, often using prefabrication technology. Modernist architects visually exposed the structure elements and restrained the colour palette, with a predominance of white and grey. They rejected in architecture all narrative, symbolism, and ornament. An important point of the doctrine of modernism was the social program focused on the development of affordable housing communities along with social infrastructure and green areas.
- **Modernism** understood more widely is "generally any movement or climate of ideas, especially in the arts, literature, or architecture, that supports change, the retirement of the old or traditional, and the forward march of the avant-garde. More specifically, adherence to the ideas and ideals of the Enlightenment. This is the sense that gives rise to the contrary movement of postmodernism".²⁰
- Modernism (1920–1960), also known as the *modernist movement*. It marked a conscious break with the past and was a dominant trend in the design practice, production, and theory of the 20th century. In general, the expression emphasizes using modern materials such as steel, glass, and concrete and manipulating abstract forms, space, and light as well as restraint in the use of colour palette, with the predominance of white, grey, and black. (*Oxford Dictionary of Modern Design: Modernism*) This strictly avant-garde trend was also known as *functionalism*.

Characteristics

- The rejection of the academic tradition of formal aesthetics and spatial hierarchies in favour of innovative creativity based on simplicity, abstraction, and the rationalization of problems arising from the place, destination, and available technology.
- Unity of spatial form and function with the structure system, which was recognized as the basic criterion of beauty and harmony in architecture.
- A clear design system, expressed in a sincere manner by the proper use of technology and the visible exposure of materials, without unnecessary decoration.
- Avoidance of symmetry in composition.
- The release of external walls from the load-bearing functions by rhythmic spacing of columns and, consequently, the possibility of a
- "Free plan" divided by light partition walls or interior arrangements; the use of closed spaces only where necessary.
- Famous slogans: "Form follows function (functions)" by L. Sullivan; "Less is more" by Mies van der Rohe, used already in 1774 by German writer Ch. M. Wieland; and "Ornament und Verbrechen" (Decoration is a crime) by Adolf Loos.
- Purism and simplicity, aesthetics of the machine, anti-metaphor, rationalism, logic.
- The action of architects and planners in the sense of a social mission to fulfil the basic needs of housing, medical care, and access to education and culture, propagating the ideas of democratization and social equality.
- Faith in progress, assignment to the architect the creative power of the Platonic demiurge.²¹

Leaders of Modernism

Frank Lloyd Wright (1867–1959); Louis Kahn (1901–1974) in the US; the Bauhaus school in Germany (Walter Gropius (1883–1969) and Ludwig Mies van Der Rohe (1886–1969) – students of Peter Behrens), Swiss and French architect Le Corbusier (Charles-Édouard Jeanneret (1887–1965)); Brazilian Oscar Niemeyer (1907–2012); and Alvar Aalto (1898–1976) from Finland.

¹⁹ Modernism in architecture does not correspond to the different ideologically modernism in the art and literature of the turn of the 19th and 20th centuries, which is related to the Art Nouveau architecture.

²⁰ After Oxford Dictionary of Philosophy 2008: Modernism.

²¹ Demiurge (Greek *demiourgós* – artisan working for people); in Platonic philosophy, the creator of the Universe.

Genesis and context of the modern movement

Modernism in architecture emerged at the beginning of the 20th century. It was a natural consequence of the growing feeling in avant-garde circles that changes in industrial society lifestyles required a completely new approach to architectural design and urban planning. In France it was Le Corbusier who significantly manifested the need to establish new principles, objectives, and an entire architecture media to follow the democratic changes in society after World War I.

We have new optics and new social life, but we didn't match to them our house (...) In the new world there can be no place for the aesthetics of the École des Beaux-Arts, defending its conservative and endangered position in culture, nor the structural rationalism of École Polytechnique. It is necessary to establish a new style, other than that 'false', and based on the truth, unmasked unnecessary 'decorum', for which the pattern is to be perfect in the form and function of the transatlantic architecture, and the test of the new 'object type ' of daily use, which govern only convenience and hygiene.²²

Elsewhere he writes

architecture becomes a mirror of the era. Modern architecture is home to ordinary people. It allows the palaces to fall. It's also a sign of the times. To analyze the house for the ordinary man, for 'everybody' to find the human foundation, human scale, typical need, a typical function; typical emotions. Please! That's most important, including everything. The time has come for dignity, man must abandon the exhibit!²³

In the sense of a social mission, there was an attempt to build new principles of spatial and social policy, free from the problem of private property, and create new aesthetic patterns unburdened by 19th-century stylistics. It was in fact a revolutionary change of understanding of architecture in its complexity connecting structure, form, space, and urbanism with the goals of industrial and social development. In the face of modernist doctrine, the academic definitions of architecture formulated at the end of the 19th century by the English art critic John Ruskin: "*Architecture is nothing but an ornament added to the building*" and "*Architecture is about what is not necessary*" and Jan Sas Zubrzycki: "*Construction is the foundation of architecture, and architecture is the beautification of construction*"²⁴ sounded archaic, even ridiculous. The architect, freed from the previous restrictions resulting from the observance of the stylistic canon, became an authentic creator, defining their individual style based on the expression of a "pure" abstract form following the planned functions and rational structure while exposing used materials.

Thanks to mass transport, it was possible to create a new model of the city, more open and spacious. Furthermore, the necessity for reconstruction after the devastation of World War I and the widely available means of mechanical production stimulated the making of brave urban assumptions on an unprecedented scale. Many architects took up these challenges with enthusiasm and faith in the social mission of their profession without foreseeing the implications of their most arbitrary design decisions. In academic circles, however, the conviction grew of the need to protect the traditional artistic values in the architecture, saved, for example, in the Vitruvian triad *Firmitas, Utilitas Venustas* as a condition for maintaining the prestige of the profession.

These two opposing approaches impacted the emergence of the avant-garde movement in architecture and planning, influenced by experiences coming mainly from two continents: European and American, but also as a result of fascination with the culture of the Far East. The search for a new expression in architecture was a response to the widespread chaos and eclecticism prevailing in the 19th-century styles borrowing of historical forms.

²² Le Corbusier "W stronę architektury", Warszawa 2012, p. 35.

²³ Fragment of the introduction to the second edition of *Ver une architecture*, Le Corbusier of 1924 r., source: Le Corbusier *W strone architektury*, Warszawa 2012, p. 43–44.

²⁴ Deriving this type of thinking from Cartesian dualism, Zubrzycki qualifies technique as a matter of reason and aesthetics as a matter of affection. In the philosophy of Descartes-duality res extensa, literally of a discontinuous substance (matter) and res cogitans (lit. thinking) a substance of thought (spirit), or duality of the body and soul (mind, consciousness). Source: Zubrzycki J.S. *Filozofia architektury, jej teorja i estetyka*, Drukarnia A. Koziańskiego, Kraków 1894, p. 104.

SEARCH FOR A NEW EXPRESSION IN ARCHITECTURE AT THE TURN OF THE 20TH CENTURY

Europe

The earliest fundamentals for European modernism began to form in England, the country that initiated the industrialization process and, consequently, first experienced the negative effects of mass production and industrialization. The Arts and Crafts movement (1860–1910), its leader, artist, and writer William Morris (1834 – 1896) acting under the influence of the utopian theory of John Ruskin (1819 – 1900), fought for the revival of the lost values of fine arts and architecture through a return to traditional handicrafts and folk art – using simple, unsophisticated forms – and the organic and noble expression of medieval styles. The Arts and Crafts movement was against industrialization and mass production and demanded social and economic reforms. It had a profound impact on art in Europe and North America, affecting the development of the American Movement of Artistic Craft (American Craftsman) and forming the basis for the development of Art Nouveau in the United Kingdom (from approx. 1880), with the leading creator Charles Rennie Mackintosh, in France (Hector Guimard), and Belgium (Victor Horta, Henry van de Velde²⁵). The Arts and Crafts movement influenced the rise and shape of the French Art Nouveau and Austrian Secession but did not develop exaggerated ornaments, going in the direction of Japanese-inspired means of subtle modesty (e.g., the Willow Tea Rooms by Macintosh, 1903).



Fig. 12 Artistic movement Arts and Crafts; Philip Webb: William Morris's Red House, England 1860. The name of the house, built of red brick and covered with red tiles, signified the protest against the dominant formula of plastered walls and shingle roofs. Photo: author Jacqueline Banerjee

Fig. 13 Charles Rennie Mackintosh: Hill House in Helensburgh, Scotland 1902–1904. The prognostic of modernist forms is manifested in the raw character, devoid of decoration, and the asymmetrical arrangement of the outer volume. Its picturesqueness, marked by the free composition of individual lumps, betrays the influence of 19th-century architect A. W. N. Pugin, who was a pioneer of the Neo-Gothic. The restraint of the outer form with rectangular windows contrasts with the warmth and exoticism of its richly decorated interiors.

²⁵ Henri van de Velde zawarł najlepiej sens walki ze "skażoną atmosferą" panującą w Belgii ok. 1890 w wypowiedzi: "Prawdziwe formy były ukryte. W tym okresie rewolta przeciw fałszowaniu form i przeciw przeszłości była rewoltą moralną", za Giedion " Czas, przestrzeń, architektura" s. 324.



Fig. 14 Belgian architect Henry van de Velde: The seat of the Kunstgewerbeschule (School of Handicrafts) in Weimar, built in 1906, adopted by the Bauhaus school in 1919. The gable façade of the building is maintained in the Jugendstil Convention; however, the lack of decoration and the rectangular windows are a symptom of the change towards modernist abstraction.

Fig. 15 Vienna secession. Otto Wagner: Majolikahaus (1898–1899). The shining ceramic decoration covering the whole building is an expression of Wagner's views, which claimed that the follow-up of architecture with the times and the emphasis on progress in structure do not necessarily lead to the grotesque: "The realism of our time must pervade the developing work of art. It will not harm it, nor will any decline of art ensue as a consequence of it; rather it will breathe a new and pulsating life into forms, and in time conquer new fields that today are still devoid of art – for example that of engineering".²⁶ The building aroused criticism from the more radical modernists. Adolf Loos called it tattooed architecture.

The architecture trend of Vienna secession (or art nouveau or Jugendstil), the most popular movement between 1890 and 1910, marks an important transition between historicism and modernism. The architecture of Otto Wagner (1841–1918) and his students Joseph Maria Olbrich (1867–1908) and Adolf Loos (1870–1933) is characterized by a strong, simple form. The bold geometric masses and flat planes without ornaments are formal features that led directly to the abstraction of modernist architecture in the 1920s.



Fig. 16 J. M. Olbrich: Secession building in Vienna, 1896. The entrance, framed by huge cubic blocks with smooth surfaces, leads to the exhibition hall, which is roofed with glass. The culmination of the monumental building is the dome decorated with laurel leaf ornaments. The inscription above the entrance: "Each age has its own art, and the freedom in art" expressed the message of art nouveau artists. Photo: M. Tobolczyk

Fig. 17 Adolf Loos: The House of Steiner in Vienna, 1910. The barrel vault was not planned for plastic effect but to compromise with the regulations of municipal authorities. To obtain building permission, the front façade of the building looks like a one-storey with superstructure and windows in the roof, while at the rear it is four storeys with a flat roof.

²⁶ Harry Francis Mallgrave, *Otto Wagner: Reflections on the Raiment of Modernity*, The Getty Center for The History of Art, 1996, p. 283.



Fig. 18 Adolf Loos: House of the Dadaist poet Tristan Tzara in Montmartre, Paris, 1926. The house is programmatically devoid of decorations. Despite some signs of symbolism, it forecasts functionalism. Picture before WW11; copyright expired.

The term "modernist architecture" appeared first in the title and content of Otto Wagner's book *Moderne Architektur* von 1895, which was translated into English as *Modern Architecture of 1895* and released in America in 1901. Otto Wagner promises in his treatise that the era of the domination of historical styles (especially represented by the buildings in the "Vienna Ring" of the Neo-Greek, Neo-Romanesque, and Neo-Baroque styles) has come to an end. He talks about the need to develop architecture, which will keep up with progress and adopt new construction technologies. He says,

Modern art must be the carrier of modern ideas and should be created for us in forms that represent our abilities, our actions, and our preferences

and

objects that are the result of modern views... and harmonize well with our environment, will never be copied and imitated.

Vienna secession between 1890 and 1910 in culture and architecture is also referred to as the Wiener Moderne (Eng. *Viennese Modern Age*). The House of Steiner (painter Lilly Steiner and her husband Hugo), designed in the suburbs of Vienna (1910) by Adolf Loos, has a shockingly simple garden façade. Its outlook, shown in photographs that appeared in publications promoting modernism, inspired many world designers. Loos gained notoriety and influenced the development of a radically rationalist modern architecture, establishing his position as one of the leading creators of the world modernist movement of the early 20th century. Loos' "Ornament is a crime"²⁷ from his essay "Ornament und Verbrechen" (1908), ²⁸ has become (along with "Form follows function" by Louis Sullivan) a famous slogan defining the main principles of the modernist movement.

USA – Louis Sullivan and Frank Lloyd Wright

The outstanding architect and theorist Louis Henry Sullivan (1856–1924) and, following him, Frank Lloyd Wright (1867–1959) blazed the modernist trail on the American continent. Their work also influenced the development of the

²⁷ According to Loos, an ornament is "a crime against the national economy in that it is a waste of human labour, money and material". He compares ornament to tattooing the "Papuan". Loos says that in civilized society, tattoos characterize only prisoners and degenerates unworthy, in his opinion, of modern man.

²⁸ Loos, A. (1908). Ornament and Crime. (1913), Innsbrück, reprinted in Vienna 1930.

European modern movement. Sullivan, often referred to as the "father of skyscrapers"²⁹ and "the father of modernism", contributed to the development of the so-called Chicago School of high-rise buildings. His legacy contains great works of architecture with outstanding creative features that have the hallmarks of art nouveau. The innovative and proto-modernist character of Sullivan's works is expressed in his bold manipulation of geometric solids with flat surfaces, which precedes his epoch. On the other hand, his strongly marked articulation of materials such as bricks and terracotta in such buildings as the Merchants' National Bank in Grinnell, Iowa (1914) and the National Bank in Owatonna, Minn., supplemented by his subtle finesse in ornamentation, shows the attachment of the architect to the tradition of good craftsmanship and handicrafts. The classic rules of the composition are evident in the regularity and harmony by rhythm, proportions, and symmetry.



Fig. 19 National Bank of Farmers in Owatonna, Minnesota, north-west of Clinton, Iowa (1908) (now Wells Fargo). Louis Sullivan's design (1856–1924). The bold manipulation of strong geometric forms and large hollow planes complemented by subtle ornaments and elaborated with a "jeweller's" precision of ceramic and metal were typical of the architect. Photo: Stanisław Tobolczyk, 1975.

The ubiquity of virtuous detail in Sullivan's architecture contradicts the popular and superficial interpretation of the slogan "form follows function". This maxim, later acquired by architects of the 20th-century international style, who used it to express the principle that architects should design a building based on the purpose of that structure, was subject to a postmodern criticism of modernism's shallow dogmatism. Nevertheless, Sullivan explained his credo: "Form ever follows function" by reference to God's or nature's creations. He wrote that in living organisms

It is the pervading law of all things organic and inorganic, of all things physical and metaphysical, of all things human and all things superhuman, of all true manifestations of the head, of the heart, of the soul, that life is recognizable in its expression, that form ever follows function. This is the law.³⁰

And a few years later,

Form ever follows function. Just as every form contains its function, and exists by virtue of it, so every function finds or is engaged in finding its form.³¹

He pointed to the need for a practical and rational approach to design without emphasizing aesthetics over function. The genius of Louis Sullivan, expressed in his design and theoretical statements, was continued in the works of eminent American architect Frank Lloyd Wright, who received practical training in Sullivan's office and used to call him "Lieber Meister" (German for "Beloved Master").

Frank Lloyd Wright was modern in the sense of his opposition to historical eclecticism but he did not identify with the paradigm of the European modernist architecture of the early 20th century. He sought to create his own theories and formulate the principles of a clearly American style in opposition to the "superficial" European modernism. The very personal style of Wright's writing, expressing his views on the relationship between man and nature in a poetic tone, connected him with the 19th-century vision of artistic creation as a manifestation of individual genius, which limited his influence abroad. Today we perceive him primarily as the creator of the principles of organic architecture. However,

²⁹ Although Jenney is more worthy of this title, this outstanding recognition of Louis Sullivan's development of high-rise buildings is found in: Kaufman, Mervyn D. (1969). *Father of Skyscrapers: A Biography of Louis Sullivan*. Boston: Little, Brown and Company. ³⁰ L. Sullivan, *The Tall Office Building Artistically Considered* (1896).

³¹ L. Sullivan, Kindergarten Chats and Other Writings, New York, Wittenborn, 1947, p. 46 (first edition 1902).

Wright's understanding of organicity was associated, as in the case of modernist movement, with the search for a modern expression of architecture worthy of the age and needs of the American industrial society. That is why Wright's creative contribution, contained in the original innovative works of architecture in the development of modernist movement, is outstanding and significant. Many, especially in the USA, consider him to be the most outstanding architect of all time. Modernist features found in the earliest houses of F. L. Wright represent the so-called "prairie style", named after his article "A Home in a Prairie Town" in the *Ladies' Home Journal* (1901). Prairie houses were characterized by low



Fig. 20 a. Frederick C. Robie House (1906), Chicago, Illinois. Manipulation of simple geometric forms. The use of four welded steel beams with a length of 30 m each has allowed a considerable overhang of the roof slabs, with contrasts of light and shadows highlighting the rhythm of horizontal planes. Photo: Stanisław Tobolczyk, 1975.

Fig. 20 b. Robie House. Open space of the room on the first floor concentrated around the central fireplace. Profiles of wooden framing of the cavities and false beams on the ceiling by their regular rhythm binds the individual elements – walls, ceilings, windows, and doors – into one harmonious whole. Perspective vanishing lines, marked by the differentiated height of the ceiling, highlight the integrating role of the fireplace in the interior. The light coming from three sides emphasizes the open plan of the living room, with no divisions. photo http://uchiblogo.uchicago.edu/archives/2009/08/robie_houses_pr.html

Fig. 20 c. Robie House stained glass windows designed by Frank Lloyd Wright

horizontal lines, harmonizing with the flat landscape of prairie, known to Wright from the days of his vacations spent in the grandparents' mansion in Spring Green, Wisconsin.³² In the later inherited property in Spring Green, he rebuilt the house, realizing the principle of subordination of the structures of nature in such a way that the house was "like a brew for the eye". The buildings surrounding the central garden were placed on the outskirts of the area, giving from almost all rooms a view of the Wisconsin River valley. From 1932, the summer house of the Taliesin Foundation school was located here.

The space of the prairie-style houses was organized centrifugally around the central furnace and fireplace, the symbolic heart of the domestic fire. The open plan had no defined divisions, and the space of some interiors penetrated intriguingly into the space of others. Thanks to the significant glazing planes, the effect of interior and exterior permeation was achieved. Wright's assertions that "the new reality is space instead of matter" and the "reality of a building is not the container but the space within"³³ became important principles of the spatial-shaping canon of contemporary architecture.

The Willits House, built in Highland Park in Illinois in 1902, was the first home to fully realize all the features of the prairie style. The highest craftsmanship of this style was expressed in the Frederick C. Robie House, built in Chicago in 1909–1910. It was recognized in 1960 as one of the most significant structures of American architecture.

Fig. 21 a. Ward W. Willits House,1445 Sheridan Road, Highland Park, Illinois. The view of the house. The characteristics of the prairie style are expressed by the horizontal arrangement of the articulated volumes of the house with dark hipped roofs rhythmically arranged at different heights. The roofs have significant overhangs, underlined at the ground level by wide porches. A typical feature of a prairie house is the contrast between solid and void, light and dark surfaces, and vertical and horizontal lines and planes. The boundaries of individual blocks and window frames and doors are marked with elongated edge bands. Photo: http://www.appraisercitywide.com/content.aspx?filename=Custom Page101.x

³² Wright, F. L., *The Natural House*, A Meridian Book, Horizon Press Inc., New York and Scarborough, Ontario, 1970.

³³ Wright's statement about his Storer Residence in Los Angeles, Cal. of 1923: "In my work the idea of plasticity may now be seen as the element of continuity.... Classical architecture was all fixation...now...let walls, ceiling, floors be seen as component parts of each other, their surfaces flowing into each other.... Here... principle entered into building as the new aesthetic continuity...**the new reality that is space instead of matter**." Vincent Scully, Jr. *Frank Lloyd Wright*. p. 18.