

Mies van der Rohe

Space, Material and Detail

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Abstract

Ludwig Mies van der Rohe is widely regarded as one of the most influential architects and architectural theorists of the 20th century. His work is unmistakable in its clarity and the rigor with which it embodies the principles of rationalism and functionalism, as well as in its spatial qualities, material expression and detailing. Typical for his style is the clear definition of place, the idea of universal space, the legible logic of the construction and precise detailing. For Mies, technological advances were a driving force of architecture, a spirit of the times that architecture should embrace and express. Above all, clarity and structure, not just in terms of the construction but also in intellectual thought, were for him the only way to create architectural space. Space for Mies was something that continues beyond its physical limits and creates connections between inside and outside.¹

Keywords: Space, Material, Detail, Universal Space,

1. Mies in Germany

Ludwig Mies van der Rohe was born on March 27, 1886 as the son of a stonemason and building contractor in Aachen. In his father's business, he first learned about the qualities of materials and how to work stone. He also grew to appreciate the value of high quality materials and of craftsmanship. As a singer in the boys' choir, he visited Aachen Cathedral almost daily and knew the Chapel of Charlemagne, remarking years later on his fascination with the way in which stone and mortar was transformed in the structure of the chapel. In his attempt to trace and comprehend its structure and construction lies the beginnings of an idea that would come to manifest itself in his architecture: that architecture is a language with vocabulary and syntax in which the separate parts relate to one another and form a whole.

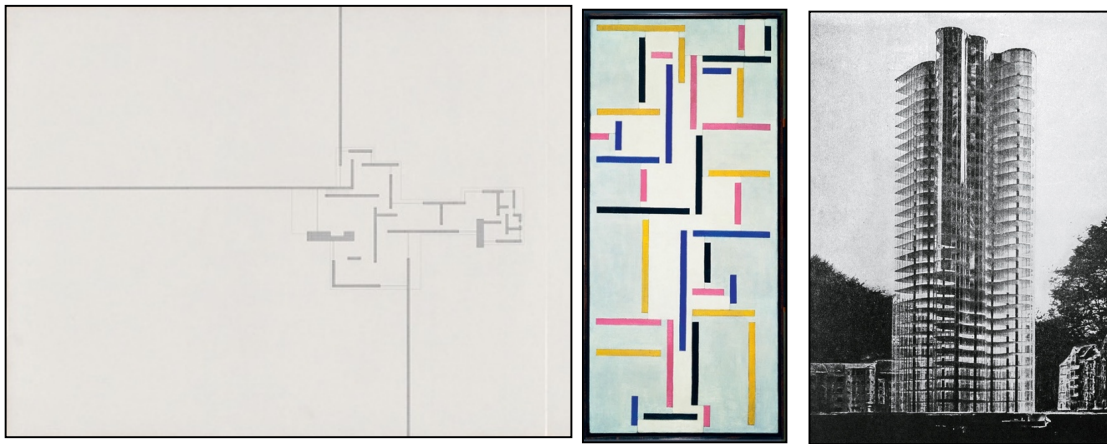
At the age of 15, he began an apprenticeship as a plasterer and developed his talent for drawing on room-sized plaster ornaments in the style of Louis XIV and the Renaissance. In 1904, he changed jobs to work as a draftsman in the architecture office of Albert Schneider where he met an architect from Berlin named Dülow who persuaded him to come to Berlin. Nevertheless, these early years of apprenticeship and his understanding of materials and craftsmanship were to put him in good stead for his later architectural work.

From 1905 onwards, he began working for the architect and furniture designer Bruno Paul in Berlin. His first work was a house for the influential professor and philosopher Alois Riehl (Riehl House, 1908) in the reform style, a building style that marked a return to simple forms and regional tradition. From 1908 to 1912, he worked in the office of Peter Behrens where he had the opportunity to advance his professional skills working on larger projects of greater significance including the German Embassy in Saint Petersburg and the AEG Turbine Factory in Berlin. His time in Berlin also marked the beginning of a lifelong intellectual interest in architecture theory, and he undertook a detailed study of the work of Karl Friedrich Schinkel.

In 1912, Mies opened an atelier of his own and went on to build a series of villas in the neoclassical style until well into the 1920s. Of these, one of the most famous is the so-called Churchill Villa, a hip-roofed villa where Winston Churchill resided during the Potsdam Conference. Mies subscribed to the fundamental belief in a new modern age and saw himself as one of the avant-garde, a protagonist of the 'new age'² working tirelessly towards developing a new kind of art appropriate to the modern living conditions of the day.³ Parallel to his early villas, but in stark contrast to them, he developed five visionary studies designed between 1921 and 1925.

Although none of the five projects⁴ were ever realized, mostly because they were highly idealized, they were presented in international exhibitions on modern architecture. To this day, they are regarded as remarkably innovative designs and as the origin of his later work.

Although unrealized, these studies demonstrate his exceptional architectural vision and fundamental attitude to space, material and design. In his design for an office building on the Friedrichstraße in Berlin (1921) he presented a vision of an entirely glazed high-rise with a variable, open floor plan. A second study for a Glass Skyscraper followed in 1922, this time with rounded forms, and in 1923 two further studies for a Concrete Country House and a Concrete Office Building introduced novel concepts for building with the comparatively new composite material the known as ferro-concrete.⁵ The office building, with its austere geometric form and wrap-around ribbon windows, can be seen as a precursor to his later high-rise blocks in Chicago. His last study for a Brick Country House in 1924, possibly inspired by a painting by Theo van Doesburg,⁶ offers a first glimpse of the open floor plan defined only by freely-placed wall slabs. The concept of continuous space that visually connects inside and outside and allows space to be perceived freely according to standpoint was later to be the basis of the Barcelona Pavilion (1929) and Tugendhat House (1930).



Model for a glass skyscraper at Friedrich-straße, Berlin (unrealized). Print, 1921
Brick Country House, project Potsdam-Neubabelsberg. Ink on illustration board
Theo van Doesburg: Rhythm of a Russian Dance. Oil on canvas, 1918

From the middle of the 1920s, Mies attained international reputation as a curator and urban planner of the Weissenhof Estate, for which he designed four apartment buildings using a revolutionary steel skeleton construction with large expanses of glass and flexibly usable living areas. But his big breakthrough came with his designs undertaken in conjunction with the interior architect Lilly Reich⁷ for the Villa Tugendhat in Brno in the Czech Republic and the Barcelona Pavilion in Spain. In 1932 Mies took part, together with Le Corbusier, Walter Gropius and J.J.P. Oud, in the 'Modern Architecture'⁸ exhibition curated by Philip Johnson and Henry-Russell Hitchcock at the Museum of Modern Art in New York, catapulting him into the limelight in the USA. As work ebbed following the Great Depression in 1929, Mies took over as director of the Bauhaus in Dessau in 1930, concentrating on the academic and theoretical study of architecture. After the seizure of power by the National Socialists in 1933, however, it became increasingly difficult for him to practice as an architect, and in 1938 he followed an invitation to become head of the architecture school at the Armour Institute in Chicago, which would later become the Illinois Institute of Technology (IIT).

2. Mies in the USA

Mies' relocation to the USA represents in many different respects a break in his architectural oeuvre. In Europe, Mies was able to build only a comparatively small number of buildings, but had achieved worldwide recognition through his expressionist skyscraper designs, the Brick Country House design and the Barcelona

Pavilion. He was a respected member of the European avant-garde with links to De Stijl and as co-publisher of the magazine *G*.⁹

In the USA, Mies was immediately successful in securing large projects. His spatial concept shifted from that of continuous space (Villa Tugendhat) to the idea of 'universal space' (as epitomized by the New National Gallery) and from the De Stijl-inspired expressionism of free forms to the rationalism of constructed symmetry. His European buildings were individual, unique works that celebrated craftsmanship, while his American works – among them the Seagram Tower office building in New York – achieved archetypal status as ultimate examples of the International Style.

In 1939, Mies founded an office in Chicago and began one year later with plans for the new IIT Campus, for which he realized a total of 15 buildings between 1941 and 1958. Between 1950 and his death in 1969, he completed at least one new project every year. Among the many milestones in his American work are the high-rise apartment buildings at 860–880 Lake Shore Drive (1951) in which Mies employed an all-steel-and-glass construction for the first time, and Crown Hall (1956) – widely regarded as his American masterpiece – where he first created a column-free universal space.

Thirty-six years after his Glass Skyscraper study for Berlin, Mies built his first office high-rise, the Seagram Building in New York. With its sleek elegance and public plaza in front, that continues seamlessly into the glazed lobby, it became the prototype for modern office buildings around the world and influenced American architecture for several decades. For the high-rise apartment building at 2400 Lake View Drive (1963), he developed an aluminum curtain wall construction in which the outer load-bearing framework is set back from the plane of the facade into the interior of the building – a concept that became widespread for all comparable high-rise constructions. The New National Gallery in Berlin (1968), completed towards the end of his life, represents the pinnacle of his vision for a universal space. In no other building is his concept of space and construction so clearly articulated as in this, the last of his works to be built in his lifetime.

3. Mies and Space

"The building art is man's spatial dialogue with his environment and demonstrates how he asserts himself therein and how he masters it. For this reason, the building art is not merely a technical problem nor a problem of organization or economy. The building art is in reality always the spatial execution of spiritual decisions."¹⁰

Mies' approach to the design of space can be broadly grouped into four evolutionary stages:

- enclosed space
- continuous space
- free plan¹¹
- universal space¹²

During his early years as an architect, the villas he built exhibit a conventional spatial arrangement (enclosed spaces) of separate individual rooms and a polarity between inside and outside. The five studies he undertook from 1921 to 1924 parallel these pre-dominantly traditional-style built projects, however, point to a new kind of spatial thinking.¹³

The first projects to embody Mies' new spatial conceptions were two villas in Krefeld, the Houses Lange and Esters. Unlike his earlier villas in Berlin with their traditional arrangement of rooms and clear delineation of inside and outside, the interiors of these two villas flow dynamically from space to space in a new, modern conception. Moving away from the traditional idea of enclosed rooms, Mies arranged a series of diagonally staggered and offset spaces with progressively larger openings towards the garden. This diagonal sequence subtly interweaves the indoor and outdoor spaces. The ability to appraise several successive spaces simultaneously served as the basis of a new spatial impression that recalls the idea of the Baroque enfilade. The American architect Philip Johnson described this new spatial perception as continuous space: "Indoors and outdoors are no longer easily defined; they flow into each other."¹⁴

With the building of the Villa Tugendhat and in particular the Barcelona Pavilion, Mies took his concept of continuous space a step further, composing a single space demarcated by a free composition of elements.

This 'free plan' – a space structured only by free-standing wall planes – was made possible by separating the load-bearing columns from the space-defining elements. The spatial simultaneity and parallel experience of indoor and outdoor spaces, and of the entire spatial continuum, was made possible by conceiving entire facades as glass planes with sliding sections and employing the reflections of the water's surface and polished natural stone walls.¹⁵

The architectural historian Siegfried Giedion¹⁶ described this new spatial conception in his book *Space, Time, Architecture*¹⁷ using the new mathematical-physical model of 'space-time'. Architecture is no longer experienced as individual compositions but through movement in space: the observer moves through an architectural space-time continuum. Beginning with Mies' buildings in America, in particular his buildings for the IIT Campus, the idea of the free plan shifted to a predominantly symmetrical floor plan geometry. What remained, however, was the separation of load-bearing structure from the space-defining elements – the differentiation between the logic of the construction and the function of spatial arrangement.

The term universal space refers originally solely to the usability of a space and not to its spatial quality. Mies uses it to denote a large, free-spanned space enclosed only by a glass facade. To illustrate this concept, he used a photo of the interior of the Glenn Martin Aircraft Assembly Buildings, designed by Albert Kahn in 1939, as a background for a collage over which he placed a series of free-standing mobile walls and horizontal planes.¹⁸ The universal space is the ultimate expression of flexible space and can be modelled or adapted to fit almost any use. The New National Gallery is a masterly expression of this spatial concept and is the last of a series of buildings that begun with Crown Hall that are essentially column-less single story hall spaces. The universal space not restricted to a specific function represents an idealized abstraction of free and pure architectural space.

4. Mies and Construction

Mies' guiding principles in his handling of construction and materials can be traced to the following four main principles:

- the search for clarity of construction
- reduction to a few formal elements and simple architectural design
- a constructional logic derived from the material
- the principle of simplicity and continuity between indoors and outdoors

The development of Mies' constructional logic is that of a gradual shift from stereotomy, i.e. building with load-bearing walls, to tectonics, i.e. construction with columns and beams. Stereotomy is the art and craft of masonry construction. Tectonics is defined as the art of construction using linear elements clad or filled in with a lightweight material. Both terms derive from the terminology used by Gottfried Semper in his book *The Four Elements of Architecture*.¹⁹

Where Mies' early buildings were inspired by Peter Behrens and Hendrik Petrus Berlage²⁰ and their monolithic wall constructions with articulated openings, Mies' designs for the Lange and Esters Houses were a hybrid construction comprising load-bearing brick external walls and a skeleton frame of rolled steel profiles. The almost entirely autonomous steel construction made it possible to both construct large window openings linking the interior and garden and to vary the floor plan on each floor.

The construction for Mies was the very basis of the art of building, asserting that "form is not the goal but the result of our work."²¹ His glass skyscrapers, constructed as steel skeleton frame buildings, epitomize his rational style, which he called 'skin-and-bones-architecture'.²² Of all his works, Farnsworth House is most exemplary of Mies' fascination with tectonics, a building that he describes as consisting of "practically

nothing”.²³ The supporting framework is both the basis and prerequisite for the free plan of the building. The floor and roof planes are held by a series of columns around the perimeter, creating a one-room house that is separated from its surroundings only by glass walls. But for Mies, it was not the construction itself that was paramount but the fact that it made it possible for him to realize his concept of a free plan and universal space.

Mies is regarded as a master of precision, and this is particularly evident in his rational organization of an overall building grid. In his brick buildings, Mies was already careful to observe brick dimensions and masonry bond patterns. Likewise, his design for the Barcelona Pavilion adheres to a grid system that defines the size of the travertine slabs of the plinth, the wall planes, glass walls and columns. For the pair of apartment blocks at 860 and 880 Lake Shore Drive, a single building grid defines the structure of the two buildings both horizontally and vertically and coordinates the alignment of the travertine paving joints on the plaza, the column grid of the facade all the way down to the stone facing of the lift shafts in the lobby. He also applied the same principle at an urban scale, arranging all the buildings of the IIT Campus in Chicago on a 7.32 × 7.32 m grid (24 × 24 foot).

While Mies applied the principle of modularity to everything from brick masonry to curtain walling for high-rise buildings, he was not interested in the mass production of architecture. For him, every building was unique and not an industrial product. His interest in traditional craftsmanship in the 1920s is very much evident in his designs for the early Berlin villas and in the meticulous brickwork of the Lange and Esters Houses. By the late 1920s, Mies grew increasingly interested in using industrially produced materials such as glass and steel. Despite his ongoing interest in modern materials, he was only moderately interested in the industrialization of building. The kind of mass production proposed by Walter Gropius or Le Corbusier was of little interest to him, but the proper use of good-quality materials and good craftsmanship was ever more important. In his own words: “...no design is possible until the materials with which you design are completely understood.”

5. Mies and Materials

Mies' declaration that “each material is only what we make of it”²⁴ describes his fundamental approach to materials. Because his buildings are so rigorously geometric and unadorned, their appearance is much more dependent on the careful choice of materials, balanced proportions and meticulously precise detailing. “Each material has its specific characteristics which we must understand if we want to use it”.²⁵ For him, this applies equally to craftsmanship as it does to industrialized technologies, and to combinations of natural materials, such as marble, onyx and travertine, and industrially produced products such as chrome, glass, steel and aluminum.

5.1 Brick

“Architecture starts when you carefully put two bricks together.”²⁶

Red brick, for Mies, fulfilled two main functions. On the one hand, it relates the material of the building to nature, and on the other, it is an expression of man's rationalism and reason. It is a universally usable material that Mies employed with a timeless quality in all phases of his work: in his early work as a load-bearing wall, then as a facing material and finally as non-load-bearing infill in frame constructions. In his American buildings, brick is used solely as a facing material or as brick infill in a steel skeleton frame structure. The only exception is the Carr Memorial Chapel on the IIT Campus with its monolithic, load-bearing external walls.

5.2 Steel

Mies first made use of a steel skeleton frame in 1927 for the Weißenhof Estate in Stuttgart. From the time of the Barcelona Pavilion and Villa Tugendhat in 1928, steel became Mies' preferred material for the load-bearing structure. The ability to reduce the structure to a few slender columns made it possible to develop designs with a free plan. Mies himself said that the Barcelona Pavilion was the first time he separated the function of the columns from that of the walls. In both projects, he clad the cruciform columns, made of four angle profiles screwed together, with a chrome mantle. Here, he was more interested in dematerializing the columns and their aesthetics than the technical details of their connections. As fascinated as he was with perfecting precise details, he was not at all enamored with the raw industrial aesthetics of nuts and bolts. Where possible, he concealed the connections, as seen in Farnsworth House, or he preferred the welding together of steel profiles, such as in the roof construction of the New National Gallery. For the Villa Tugendhat, with its two-story steel frame, the construction is only articulated as free-standing cruciform columns in the main living area, while on the upper level the columns are concealed within the walls for pragmatic reasons. The construction is made visible in an idealized, abstract form. It is not self-serving but serves the room.



Apartment building at 860–880 Lake Shore Drive under construction. The photo shows the structural columns and the non-load-bearing I-beams.

Crown Hall under construction, IIT, Chicago 1955

For the high-rise apartments at 860–880 Lake Shore Drive, Mies employed steel for both the building structure and the facade for the first time. He developed wall and facade systems made of visible steel profiles that made reference to the actual construction but were, as a rule, not part of the actual supporting framework. With their clear forms and functionality, their rational steel frames and curtain walls, the steel skyscrapers in Chicago were a prototype of the modern high-rise block. "Steel," according to Mies, "... is the bones, glass the taut skin over the skeleton."²⁷

Mies' concept of universal space, realized as a column-free multi-functional space, was made possible by the wide spans of steel roof constructions. The roof of the New National Gallery is an especially complex engineering feat with a grid of steel members supported on just eight columns. The construction was welded for aesthetic reasons and the thickness of the roof 'slab' is slightly taller towards the outer edges and in the centers to create the optical impression of being completely flat without appearing to sag. The entire roof was assembled at ground level and then hoisted upwards with hydraulic presses to rest on the columns. This was without doubt the most technically complex of Mies' buildings made of steel.

5.3 Glass

The importance of glass as a material for Mies can already be seen in his idealized designs for an office high-rise on the Friedrichstraße and glass skyscraper at the beginning of the 1920s. Its novel construction concept shows the column grid set back from the front plane of the facade and a completely glazed facade membrane. The 'window' as a link to the surroundings and indicator of human scale was replaced by a facade that responds universally to its surroundings and became generalized as an expression of the International Style. "My experiments with a glass model help me along the way and I soon recognized that by employing

glass, it is not an effect of light and shadow one wants to achieve but a rich interplay of light reflections.”²⁸

The dematerialization of the wall and unhindered connection between the interior and the natural surroundings was first realized most convincingly in the Barcelona Pavilion and taken to perfection in the Farnsworth House. The material glass and transparent building skin are an essential part of Mies’ architecture. He interpreted transparency²⁹ in two respects: in the direct sense as a property of light- and air-permeable materials and in a figurative sense as a means of spatial arrangement in which several different spaces can be seen at once.

The most lasting influence on the architecture of offices and work- places was without doubt the development of the curtain wall, first seen in the buildings on Lake Shore Drive and Lake View. The breakthrough for this new suspended facade system, however, came with the Seagram Building in New York (1958). Mies succeeded in applying the highly efficient facade unit as an internal organizational system. The system of grid-based modular facade panels was used as an ordering principle for the adaptive spatial planning, at the time a revolutionary new concept for flexible work- spaces. This also made it possible to incorporate modular installation elements within the building skin, for example office partitions and lighting and ventilation systems. The curtain wall became the new uniform face of the modern city and not only corresponded to the new modern age but also created the conditions for efficiently organizing staff in the universal workplace. Through standardization and categorization, the curtain wall was replicated endlessly, ultimately undermining the role of the designing architect and Mies’ idea that each building is unique and site-specific.³⁰

Conclusion

For Mies, flexibility and the ongoing development of tried and tested concepts was more important than originality – each new building improved on and perfected his earlier work. Over a period of 60 years, he continued to explore the same primary themes of space, material and detail. His buildings are timeless and have lost nothing of their singular presence. The reconstructed Barcelona Pavilion, the Crown Hall at IIT or the New National Gallery in Berlin are still exemplary in their reduced aesthetics as buildings that demonstrate his architectural philosophy of “less is more”.⁴³

1 cf. David Spaeth, “Ludwig Mies van der Rohe: A Biographical Essay”, in: *Mies Reconsidered: His Career; Legacy, and Disciples*, The Art Institute of Chicago und Rizzoli, New York 1986.

2 The era of architectural modernism began in the 1920s in response to the stylistic pastiche and ballast of the past and as a reaction to the entirely new social structure after the First World War.

3 Fritz Neumeyer, *The Artless Word: Mies van der Rohe on the Building Art*, MIT Press, Cambridge (Mass.) 1991.

4 Wolf Tegethoff, *Die Villen und Land- hausprojekte von Mies van der Rohe*, R. Bacht, Essen 1981.

5 The historical development of ferro- concrete construction in the Third Reich began with the registration of a patent by Joseph Monier in 1880. From 1900 onwards the term *Eisenbeton* (iron- reinforced concrete) began to be used, and from 1941 onwards the term *Stahl- beton* (steel-reinforced concrete).

6 The floor plan of the Brick Country House seems heavily influenced in its formal arrangement by the De Stijl artistic movement of the time, especially Theo van Doesburg’s painting “Rhythm of a Russian Dance” (1918) to which it bears remarkable similarities.

7 Lilly Reich (1885–1947) collaborated closely with Mies van der Rohe from 1927 onwards up until his emigration in 1938. The tubular steel chair designs for the Weißenhof Estate are attributed to her.

8 The exhibition marked the first time that the International Style was institutionalized and officially recognized.

9 G was a German journal of avant-garde art and architecture that was published at irregular intervals in 1923 and 1924. The title of the journal G derives from the word Gestaltung (design). A total of six issues were published.

10 Mies in a lecture entitled “The Preconditions of Architectural Work” (1928), cited in: Fritz Neumeyer, *The Artless Word: Mies van der Rohe on the Building Art*, MIT Press, Cambridge (Mass.) 1991, p. 299.

11 An excellent example is the model house for the Berlin Building Exhibition in 1931. Published in: *Die Form*, no.6 and no.7, 1931.

12 Just two years after the completion of Crown Hall, Mies showed collages of his design for a column-free room with wide-span space-frame structure for the Convention Hall Project, Chicago, Illinois 1954.

13 Interestingly, Mies never adopted Adolf Loos’ concept of “Raumplan” in which the height of each room is modulated depending on function and size.

14 Philip Johnson’s commentary on the occasion of the first major exhibition on Mies van der Rohe in New York’s Museum of Modern Art in 1947. Philip C. Johnson, *Mies van der Rohe*, New York 1947, p. 30. Cf. also Ulrich Mueller, *Raum, Bewegung und Zeit im Werk von Walter Gropius und Ludwig Mies van der Rohe*, Akademie Verlag, Berlin 2004, p. 92.

15 Anke Naujokat, “Schichtung, Über- blendung, Collage. Formen und Bedeutung architektonischer Simul- tanität”,

published in: *Simultaneität: Modelle der Gleichzeitigkeit in den Wissenschaften und Künsten*, Transcript Verlag, Bielefeld 2013.

- 16 Sigfried Giedion was Secretary General of the Congrès Internationaux d'Architecture Moderne (CIAM).
- 17 Sigfried Giedion, *Space, Time and Architecture: The Growth of a New Tradition*, Harvard University Press, Cambridge (Mass.) 1941.
- 18 The photomontage was made in 1942 for a concert hall design and is a composition of pencil, painted paper and a glued-in reproduction of Aristide Maillol: *La Méditerranée* on a silver bromide gelatin emulsion print of a photograph, 75 × 157.5 cm, Museum of Modern Art, New York.
- 19 Gottfried Semper, *The Four Elements of Architecture*, Cambridge University Press, Cambridge 2011 (originally published in German in 1851) is a key work of architecture theory. Semper describes fire (the hearth) that created community, the "embryo of architecture", as a holy fire around which the elements of the roof, enclosure and mound are arranged.
- 20 In a conversation with Philip Johnson, Mies remarked that he saw Berlage's stock exchange building in Amsterdam with its monolithic brickwork as an archetypal example of rational building. Philip Johnson, *Mies van der Rohe*, Museum of Modern Art, New York 1947, reprint 1978.
- 21 Cited in Peter Collins, *Changing Ideals in Modern Architecture*, University Press, London 1965.
- 22 Here the skin is the glass and the bones the concrete framework.
- 23 www.farnsworthhouse.org
- 24 Cited in: Fritz Fritz Neumeyer, *The Artless Word: Mies van der Rohe on the Building Art*, MIT Press, Cambridge (Mass.) 1991. Neumeyer provides a comprehensive interpretation of the philosophical basis of the architect's thoughts and writings and includes a commentary of nearly all of Mies' writings, from published articles to handwritten notes.
- 25 Recorded in Werner Blaser's notes of conversations with the architect during his period in Chicago between 1951 and 1953.
- 26 Mies van der Rohe in: David Spaeth, *Mies van der Rohe – Der Architekt der technischen Perfektion*, Deutsche Verlags-Anstalt, Stuttgart 1986.
- 27 Cited in: "Ludwig Mies van der Rohe", in: *Der Spiegel*, 35/1969.
- 28 Ludwig Mies van der Rohe, "Hochhäuser", *Frühlicht* 1, Nummer 4, 1922, p.124, translated in Fritz Neumeyer, *The Artless Word: Mies van der Rohe on the Building Art*, MIT Press, Cambridge (Mass.) 1991, p. 240.
- 29 Colin Rowe and Robert Slutzky, *Transparency*, Birkhäuser, Basel, Boston, Berlin 1997.
- 30 The British architecture journal *Architectural Review* published a special edition entitled "Machine – Made America" in May 1957 (vol. 121) dedicated to the curtain wall, including an ironic commentary on the role of the architect in the design as being fettered by the catalog of general technical details.
- 31 Max Stemshorn, *Mies und Schinkel – Das Vorbild Schinkels im Werk Mies van der Rohes*, Ernst Wasmuth Verlag, Tübingen 2002.
- 32 Ludwig Mies van der Rohe, 1923, cited in: Fritz Neumeyer, *The Artless Word: Mies van der Rohe on the Building Art*, MIT Press, Cambridge (Mass.) 1991, p. 241.
- 33 *Ibid.*, p. 242.
- 34 Ludwig Mies van der Rohe referred to the doctrine of the late classical neoplatonist Aurelius Augustinus, cited in Ulrich Conrads and Peter Neitzke, *Bauwelt Fundamente 94, Mensch und Raum: Das Darmstädter Gespräch* 1951, revised edition. Vieweg, Braunschweig 1991, p. 48.
- 35 Stanford Anderson, Peter Behrens and a New Architecture for the Twentieth Century, MIT Press, Cambridge (Mass.) 2002.
- 36 The term "rectangle élastique" was coined by the French artist Fernand Léger.
- 37 Le Corbusier first used the term "plan libre" in 1914 in the schematic construction for the Dom-ino House.
- 38 Corbusier describes the "promenade architecturale" as a path through a built space through which a sequence of images unfolds for the visitor. See also: Flora Samuel, *Le Corbusier and the Architectural Promenade*, Birkhäuser, Basel 2010.
- 39 Le Corbusier developed his color theory "Polychromie Architecturale" in 1931. For him the color scheme of a building was a crucial aspect as important as the plan and section.
- 40 Le Corbusier defined the principles of his new architecture in 1927 in the publication *Les cinq points de l'architecture moderne* written by himself and his cousin Pierre Jeanneret.
- 41 Cf. also Eduard R. Ford, *Das Detail in der Architektur der Moderne*, Birkhäuser, Basel, Berlin, Boston 1994.
- 42 In *Aircraft* (1935), Le Corbusier celebrates the aircraft as the pinnacle of human technological achievement.
- 43 Although the statement "less is more" is commonly associated with Mies, he originally heard it in Peter Behrens' office. See Detlef Mertens, *Mies*, Phaidon, London 2014.