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# Solar Buildings in the 1920s
# The Discourse on Best Sun Orientation in Modern Housing

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ABSTRACT

The orientation of housing estates in relationship to the sun's position has been an important topic throughout architectural history. While the vast majority of studies have stated that the best housing orientation is facing the building's long side toward the south, most architects and urban planners of the 1920s preferred that the building's long sides be oriented to face east and west. This paper analyzes when this movement came to the fore and why architects of High Modernism, such as Walter Gropius and Otto Haesler, among others, decided against a building orientation that has been favored throughout history, including today. It will discuss the modernist arguments for east and west orientation, including their contemporary counterarguments, which are echoed in today's discourse of south orientation in housing.

## 1. INTRODUCTION

High Modernism had a strong interest in exposing housing estates to daylight and fresh air. Light and air were directly associated with the idea of a hygienic way of living, and architects regarded themselves as playing a major role in providing such conditions through urban planning and the design of new housing schemes. Sigfried Giedion, for example, pointed to the importance of "Licht, Luft, Oeffnung" (light, air, opening) on the cover of his 1929 book *Befreites Wohnen* (Liberated Housing, fig. 1), in which he proclaimed, "Beautiful is a house that corresponds to our life. This requires: LIGHT, AIR, MOVEMENT, OPENING."(1)

Sun exposure in housing has been an important topic throughout architectural history. As John Perlin points out in his 2013 book *Let it Shine*, thousands of years ago, building the main spaces toward the south had already been the generally accepted strategy for harvesting the sun's light and heat. That continues today. Particularly when targeting a low- or zero-energy building, the preferred orientation of all rooms is to the south. In strong contrast, most modern architects and urban planners of the 1920s preferred orienting the building's long sides to the east and west. John Perlin and Anthony Denzer have presented overviews of the modern discourse related to sun orientation.(2) The following paper focuses on two main questions: When exactly did modern architects and urban planners begin to emphasize sun orientation? And what motivated them to orient the rooms to face the east and west?

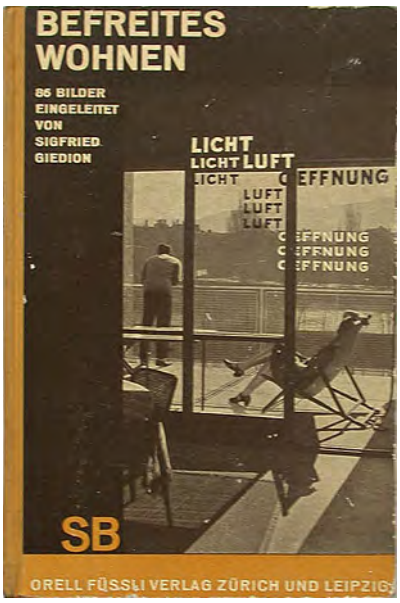



Figure 1. Cover of Sigfried Giedion's *Befreites Wohnen* 1929.

An investigation of housing developments up to the mid-1920s shows no distinct preference for the buildings' sun orientation. Instead, urban design principles emphasized specific local conditions of a particular site and located buildings parallel to the street. In Bruno Taut's and Martin Wagner's Hufeisensiedlung in Berlin (design 1925), for example, the building that is shaped like a horseshoe surrounds a pond where groundwater comes to the surface (fig. 2). The streets of the Weissenhofsiedlung (design 1925) follow the contour lines of a hill in Northern Stuttgart and many of the buildings are oriented toward the best view of the city (fig. 3). An early housing estate by Ernst May in Frankfurt, Römerstadt (design 1926), emphasizes the course of the river Nidda (fig. 4). As we can see in these urban developments, the consideration of orienting rooms toward the sun did not play the most eminent role.

Figures 2-4. Left: Hufeisensiedlung 1925–33; right: Weissenhofsiedlung 1925–27; bottom: Römerstadt 1926–28.

The tremendous change in the design of housing estates can be best understood by showing two 1929 examples, the Siemensstadt in Berlin (fig. 5) and the Dammerstock in Karlsruhe (fig. 18). In both cases, parallel rows of buildings run from north to south, with streets for car traffic running perpendicular to the building rows. The rows are accessed by pedestrian walkways that can be used by cars when moving in and out. The modernists created the term "Zeilenbau" (row building) for this layout. When did this scheme prevail and with which arguments?

Figure 5. Siemenstadt, Berlin 1929–31.

## 2. OTTO HAESLER—DEFINING ZEILENBAU

A likely starting point is Otto Haesler, an architect who began his own practice in the small town of Celle, Germany, in 1906. In comparison to other architects of High Modernism, Haesler's limited prominence may have originated in his decision to live in Eastern Germany after the war, while the more prominent architects such as Walter Gropius, Ludwig Mies van der Rohe, and Ludwig Hilberseimer, among others, emigrated to the U.S. However, by the late 1920s, Haesler was well known and his Siedlung Rothenberg in Kassel made it into the famous 1932 Museum of Modern Art exhibit and catalog (fig. 6–7).

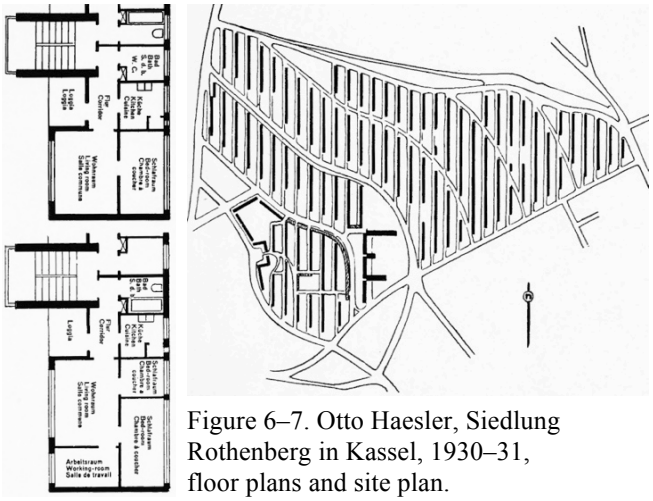
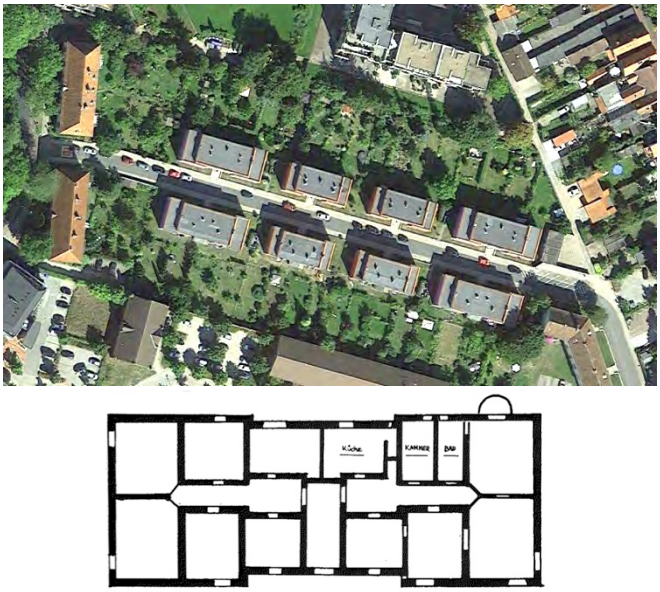


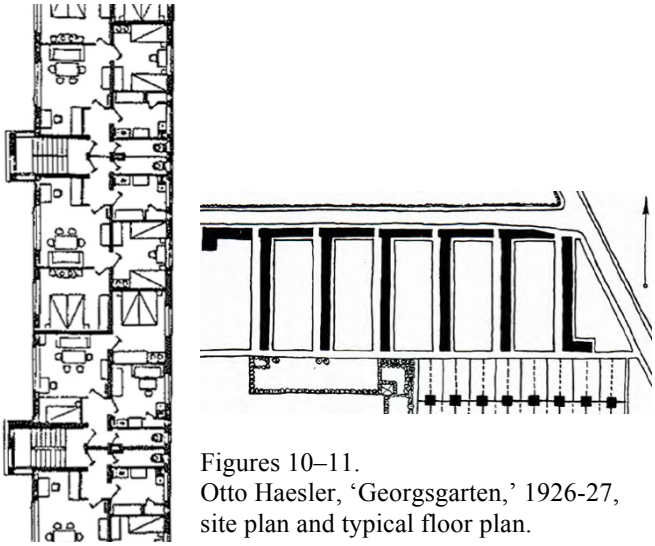
Figure 6–7. Otto Haesler, Siedlung Rothenberg in Kassel, 1930–31, floor plans and site plan.

It was not until 1924 that Haesler became a widely known architect of the Neues Bauen. In the early design of a housing estate in Celle in 1924-25, the so-called "Italienischer Garten" (Italian Garden), Haesler planned buildings parallel to a west-east street, which resulted in gardens facing to the north and south (fig. 8–9). This changed in the following housing estate Haesler designed, the "Georgsgarten" in Celle in 1926-27 (fig. 10–11). Here, he designed houses in the north-south direction that were accessed from a pedestrian path to the west of each building. All living spaces and staircases were oriented to the west and almost all bedrooms and the kitchen to the east. Haesler said that he designed this layout for the best sun orientation of the spaces, meaning that the sun entered the rooms when they were in use: the bedrooms in the morning, the living space in the evening.(3) Although both housing estates had a modern formal vocabulary, it was the latter that made Haesler widely known.



Figures 8–9. Otto Haesler, 'Italienischer Garten,' 1924-25, site and typical floor plan.

In the Georgsgarten all building rows are not only treated the same way—with even the pedestrian access on the same side of each building—they also have the same distance from one another. As we have seen in earlier estates, the building rows were normally parallel to the street and had a larger green space on the opposite site of the building, which allowed a clear definition of the public (street) space and the private (garden) space. By contrast, Haesler justified his design scheme as the realization of an equal standard with equal insolation for all units.



Figures 10–11.
Otto Haesler, 'Georgsgarten,' 1926-27, site plan and typical floor plan.

As we don't know of a stricter scheme with north-south running rows earlier than the Georgsgarten, we can identify 1926 as the year in which Zeilenbau started to spread as an organization scheme. Four characteristics can be listed to define Zeilenbau:

a) orientation of rooms to east and west;
b) building rows with equal distance;
c) building rows accessed by pedestrian walkways;
d) main car traffic only perpendicular to buildings rows.

The main arguments for this orientation as mentioned so far were the following:

a) Hygiene: Hygienic living for all classes was an important demand in the 1920s and closely connected to urban design. "In radical Zeilenbau, hygiene means exclusively sun orientation," said Adolf Behne in 1930.(4)
b) Day rhythm: Sunlight should be in the bedrooms to the east when people get up, and in the living room to the west when people come home from work.
c) Social equity: People of all classes should have equal access to sunlight; Zeilenbau guaranteed that everybody living in those row buildings receive that.

In addition, two aspects were relevant: aesthetics and economics:

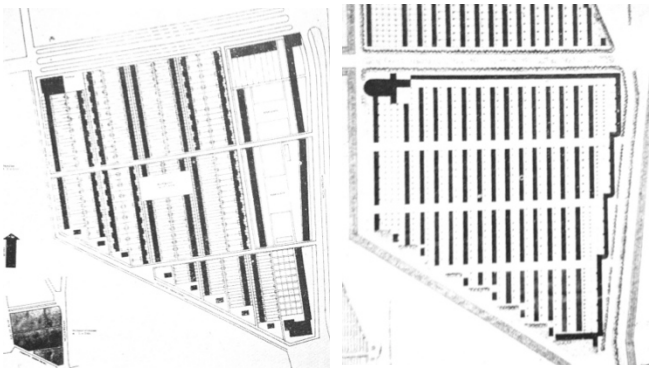
d) Aesthetics: Despite the fact that most modern architects stated that the form results from the necessities of the task, there is no doubt that a repeated formal language can be found in many Zeilenbau estates. Only few

architects tried to justify Zeilenbau aesthetically, for example Georg Lüdecke, who argued that a multi-family house with bedrooms and living rooms facing only south "would look too thin with its low building depth."(5) Lüdecke stated that in an east-west running building with the main spaces facing south, the northern rooms—kitchen, bathroom, staircases, etc.—have less room depth, which made a building thinner. (As a rule of thumb today, buildings with south-facing rooms have a depth of 35 feet; buildings with east- and west-facing rooms tend to be 42 feet deep.)

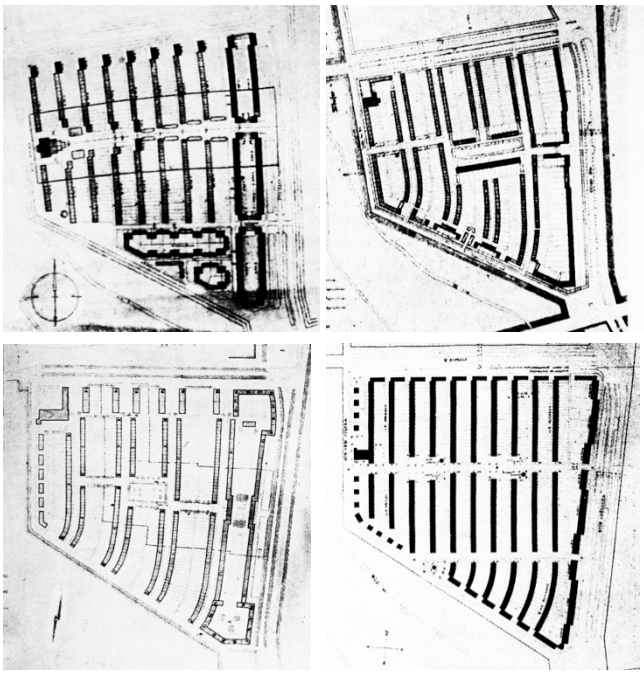
e) Economy: Lüdecke's argument was also an economical one. Since deeper buildings have a higher floor area–to–facade ratio, less facade surface needs to be built for the same floor area. In his words, the "multi-family house [...] needs for economic reasons a larger building depth"(6) and should therefore run north-south. When we look at Haesler's floor plans (fig. 11, 19, 21) we can see that his north–south running buildings were actually relatively thin, and in fact they were criticized for not being economical.(7)

## 3. DAMMERSTOCK SIEDLUNG

The Georgsgarten was widely discussed in architecture journals(8) and had a major influence on following designs. We can study the further development and Haesler's influence in the Dammerstock Siedlung in Karlsruhe, which is considered the epitome of Zeilenbau. Dammerstock began with an urban competition in 1928, and it is telling that the project brief had already included the requirement that all buildings run north-south. Taking a look at the different competition entries, we see that almost all of them followed this requirement.(9) Walter Gropius's design received the first prize**;** Otto Haesler's scheme was second. Gropius presented the site plan with true north at the top (fig. 12), while Haesler turned the site plan a few degrees so that he could present the building rows in a strictly vertical direction (fig. 13). One might speculate that Haesler's presentation expressed his clear preference of strict north-south direction. Several third prizes followed either Gropius's or Haesler's presentation (fig. 14-17). Gropius and Haesler had to work together to define the final scheme for Dammerstock (fig. 18)**,** and many of the awarded architects were included in the design and realization of the rows.



Figures 12–13. Dammerstock competition 1929**:** first prize by Walter Gropius (left), second prize by Otto Haesler (right).



Figures 14–17. Third prizes by Wilhelm Riphahn/Caspar M. Grod; Wilhelm Lochstampfer/Paul Schmitt; Hans D. Rösiger; Karl Th. Fritz.

A comparison of Gropius's and Haesler's competition entries to the final scheme identifies elements from both entries. Both designs had streets for car traffic running perpendicular to the building rows and pedestrian walkways parallel to them. Gropius had two streets, Haesler had three. In the final scheme we see that two streets were realized. Gropius had originally formed pairs of building rows with an access walkway in the middle, while Haesler designed all rows with equal distance and each row with an individual access. In other words, Haesler proposed twice as many access walkways as Gropius. In the final scheme, the rows

have equal distance with only one walkway accessing two rows to the east and west. Gropius argued that, in addition to a cost reduction from the reduced number of walkways, his scheme allowed the users to have a quieter garden-side, which is more important than having exactly the same floor plans. Obviously, Haesler strongly opposed the scheme of one walkway accessing two rows because it led, in his opinion, to unequal access to sunlight. He therefore refused to design houses that were oriented, in his view, in the wrong way.

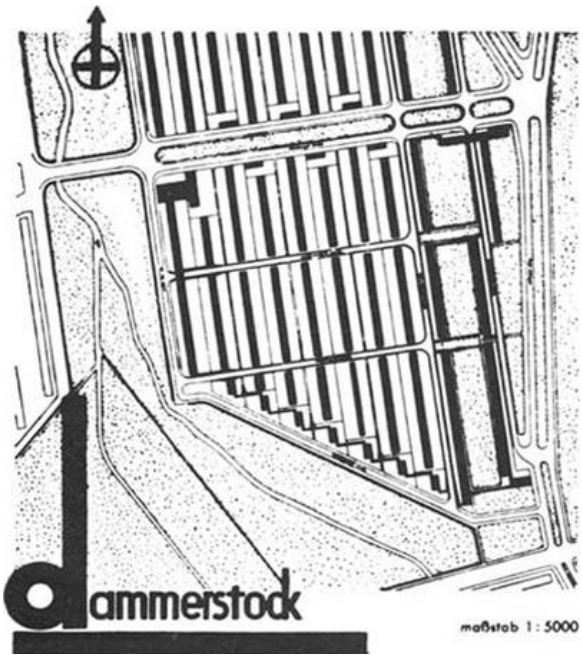



Figure 18. Dammerstock Siedlung 1929, final scheme.

The largest building Haesler designed in Dammerstock was on the northeastern corner of the site. The T-shaped building contained apartments in the part running north-south and a washhouse and district heating unit in the northern part. This building was accessed by pedestrians from the west; living rooms, loggias, and staircases were located to the west, and bedrooms to the east (fig. 19–20). Compared to the Georgsgarten, Haesler succeeded here in having all bedrooms strictly to the east. Another interesting aspect of the design is the staircase whose protrusion shades the apartment lying north to it. Here, Haesler placed the loggia, which is mainly used in summer when its users prefer shade. The loggia also works as a buffer space to the living room, preventing excessive shading. Haesler described this project in 1929 as follows:

"Increased health for the people requires that the most advantageous insolation, lighting, and ventilation of the rooms, along with the most advantageous access to the site, be in the foreground. *'No room without sun!' is not enough anymore.* Instead we need to specify: only morning sun in the bedrooms and afternoon sun, at least, in the living rooms—even better would be morning and afternoon sun." (10)

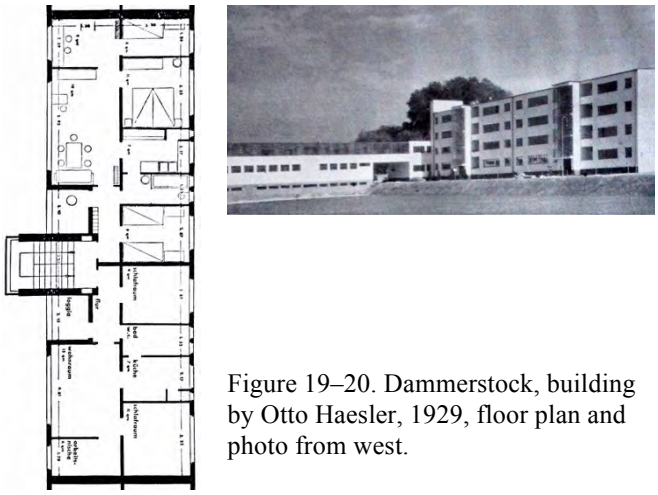


Figure 19–20. Dammerstock, building by Otto Haesler, 1929, floor plan and photo from west.

## 4. THE CONTROVERSY STARTS: BUILDING ORIENTATION TO EAST–WEST VERSUS SOUTH

Otto Haesler followed the design principles of the Zeilenbau dogma all his life. As Hans Schmidt stated, the Georgsgarten "presents the entire path Haesler followed consequentially from then on, from the housing program to the building system."(11) However, there were several architects, who realized already around 1930 that the orientation of rooms to the east and west might not be the best. Since these architects published their investigations and results in major journals of the time, it would be very odd if Haesler didn't know about them. One such architect, Paul Schmitt, earned third prize in the Dammerstock competition in collaboration with Wilhelm Lochstampfer (fig. 15). Only a year after the competition, his published article stated that the north-south direction of rows had become an "urban dogma, which had occurred from a more or less purely emotional attitude and had never been proven" and was thus in need of "urgent clarification."(12) As Schmitt clearly described, when the sun reaches its maximum altitude angle in winter, it is the north-south running path and not the rooms inside the buildings that receive maximum sun radiation. Before and after solar

noon, the sun hits the west and east facades in unfavorable azimuth angles that do not allow for effective sun radiation into the rooms. As Schmitt also pointed out, it's not just the period of insolation in the rooms that's important, but also the altitude angle at which the sun hits a facade. The strongest radiation into a room could be reached if the sun's rays hit the windows at a right angle, while the smaller the angle between the facade and the sun's rays, the less radiation enters the room:

"The radiation rate at south walls is substantially stronger in the cold season**,** and particularly in the transition periods**,** than in midsummer and therefore particularly favorable. [...] The radiation at east and west walls is the least in the cold season; it reaches its peak in the hot season and falls behind compared to the south walls in the transition period."(13)

In addition, since most of the cold and windy weather normally comes from the west, a long front to the west supports "heavy cooling and draft in housing units, in connection with higher heating use in winter."(14) However, while Schmitt undoubtedly demonstrated that orienting living and bedrooms to the south and kitchen, stairs, bathroom, toilet and secondary rooms to the north has significant advantages compared to any other orientation, he was heard by only a few architects and urban planners. Ludwig Hilberseimer, for example, referred to him in 1930.(15)

Haesler did not explicitly respond to Schmitt's article. However, in his autobiography of 1957, he stated, "In my opinion it is not the length of insolation that is important**,** but that the sun shines on the rooms when people use them."(16)

The controversy also surfaced in the competition of the Haselhorst Siedlung in Berlin, launched in 1928. Similar to Dammerstock, the competition brief stated that Zeilenbau should be the preferred setup since it "secures an equally favorable sun condition for all housing rows and the best ventilation."(17) The 221 competition entries were quickly critiqued for their "schematism" of using the "solar oriented stripe building (Streifenbebauung)."(18) Walter Gropius collaborated with Stephan Fischer for first prize, and Otto Haesler collaborated with Carl Völker for fourth prize. Haesler designed a scheme with buildings in uncompro–mising north-south direction (fig. 21–22). Compared to his Dammerstock entry, he did not adapt the orientation to angled streets surrounding the competition site.

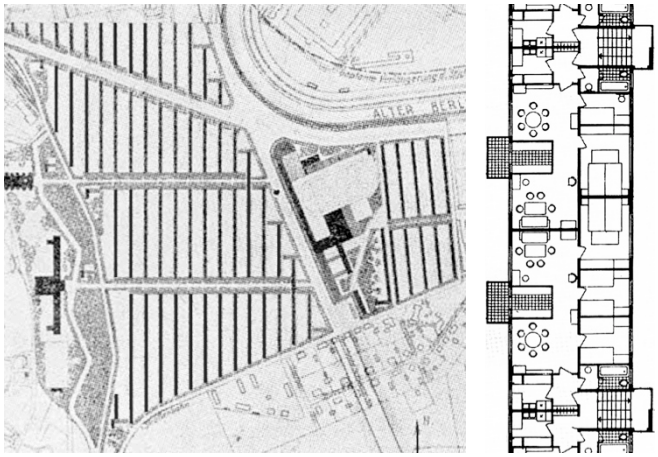


Figure 21–22. Otto Haesler and Carl Völker, entry for the 1929 Haselhorst competition, fourth prize.

Only a few competition entries, including one by the architect Konstanty Gutschow, resisted the orientation dogma and designed the building rows in the opposite direction. In his project description, Gutschow proclaimed, "Insolation mainly through southern sun must be considered the only really effective insolation in our climate in the winter months."(19) Considering the ongoing discourse, it is surprising that his entry won a fourth prize (fig. 23).

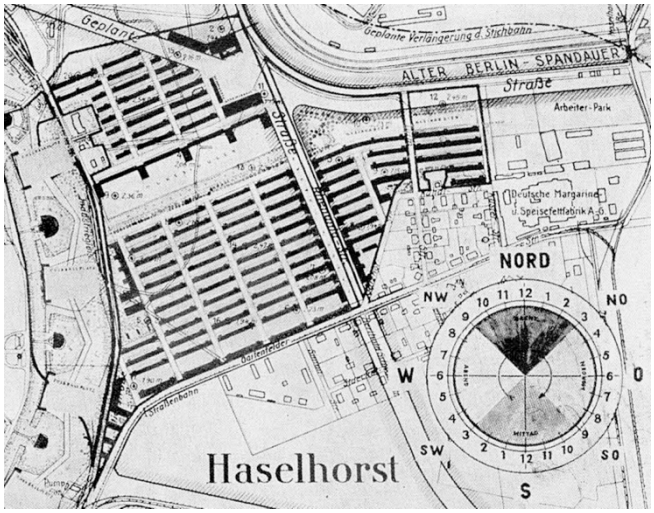



Figure 23. Konstanty Gutschow, entry for the 1929 Haselhorst competition, fourth prize.

Georg Lüdecke's entry in the Haselhorst competition was not considered for an award (fig. 24). However, a year later he published his design with an enthusiastic plea to orient rooms to the south: "It is time to advocate [...] for pure south lighting of housing."(20) As he explained, he designed multi-family buildings running north-south along the streets

only for economical reasons and only to achieve townhouses with south-facing rooms in the center of the estate, which he clearly preferred. "The pure south lighting of rooms will prevail [...], likely in a time not too far away."(21) Indeed, looking at the floors plans he proposed**,** we are immediately reminded of today's low-energy houses (fig. 25).

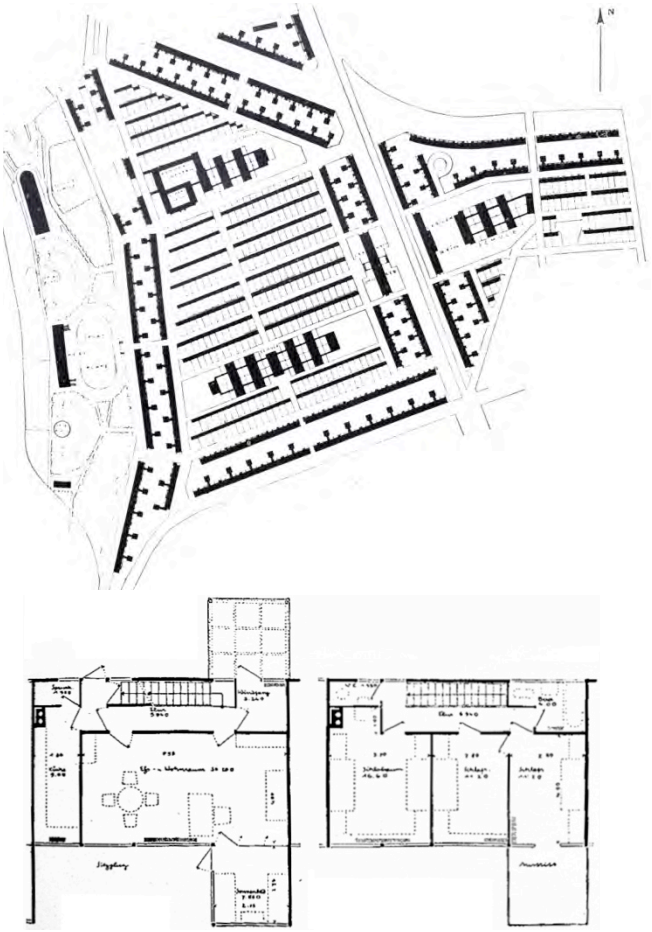


Figure 24–25. Georg Lüdecke, entry for the 1929 Haselhorst competition and plan of a single-family home that he built for the 1930 International Hygiene Exhibition in Dresden and used to exemplify the Haselhorst scheme (right: ground floor; left: upper floor).

## 5. OUTLOOK

There were other architects and urban planners who wrote against the orientation dogma and tried to convince their peers to return to the south orientation of all rooms, the most vocal being Ludwig Hilberseimer. His considerations focused on the term "Raumdurchsonnung" (sun shining through space), which is the title of a 1930 journal article.(22) Hilberseimer studied north-south running buildings and concluded that although the sun shines on east and west facades for quite a long time, little sun radiation actually comes *into* the room. He concluded that insolation is not a matter of surface**,** but one of space and called this "Durchsonnung" (shining through). Since space is much more important than surface, he dropped the dogma of north-south running buildings that he preferred two years earlier. In 1931, another architect, Hans Plessner, wrote that the mid-nineteenth century discourse on sun orientation clearly favored the south and therefore the opposite of "today's almost fashionable appearing preference for north-south running rows."(23) Other critics, such as Adolf Behne, warned in 1930 that the schematic and monotonous layout of building rows—regardless of their direction—does not reflect the society altogether. He called Zeilenbau "the dictatorial method, the method of the either-or."(24)

In other words, although we can list a variety of architects, urban planners and critics who argued against north-south running buildings and strongly voted for the south orientation of rooms, the vast majority of designed and completed projects followed the dogma that started in 1926 and had its peak in 1929. Even when the economic downturn in the early 1930s hit the industrial world and led to reduced housing construction, the dogma remained and continued after the Second World War. All but one of Le Corbusier's Unités (Marseille, Nantes, Berlin, Briey, Firminiy, 1946-67) serve as examples of exactly north-south running buildings. While these are single buildings, architects also continued to build entire housing estates in this scheme, such as the Grindelhäuser in Hamburg in 1946–56 (fig. 26). One might speculate, however, that the aesthetic interest was prevalent in these cases. Both the Unités and the Grindelhäuser are high-rise buildings gliding like ocean liners in a sea of trees. Such a nautical image could only be achieved by designing both long sides to look the same, and this was possible only with similar rooms facing to the east and west. Buildings with one side appearing more closed (kitchens, bathrooms, etc. to north) and one side more open (living spaces, bedrooms to south) hardly convey the image of an ocean liner. However, no matter which building direction is ultimately chosen, inventing powerful architectural ideas and merging them with environmental and social requirements toward a masterful entity remains an ultimate task for architects.

Figure 26. Grindelhäuser in Hamburg 1946–56.

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(1) Sigfried Giedion, *Befreites Wohnen*, (Zurich: Orell Füssli, 1929), 5, emphasis in the original.

(2) John Perlin, *Let it Shine*, (Novato: New World Library, 2013). Anthony Denzer, "Modern Architecture and Theories of Solar Orientation," *2014 ASES National Solar Conference Proceedings*.

(3) Cf. Angela Schumacher, *Otto Haesler und der Wohnungsbau in der Weimarer Republik*, (Marburg: Jonas Verlag, 1982), 54-57.

(4) Adolf Behne, "Dammerstock," *Die Form* 5 (1930) 6: 163–66, esp.165.

(5) Georg Lüdecke, "Südbelichtung der Wohnräume im Einfamilienhaus," *Die Baugilde* 1930, 1480–85. esp. 1480.

(6) Ibid.

(7) "Beurteilung durch das Preisgericht," *Zeitschrift für Bauwesen* 79 (1929) 4: 96.

(8) For example Heinrich de Fries, "Organisation eines Baugedankens," in *Die Form: Zeitschrift für gestaltende Arbeit* 1. 1927, 193-201.

(9) All competition entries in: Ernst Völter, "Der Sieg der Streifenbebauung. Bemerkung zu dem Wettbewerb 'Dammerstock,' Karlsruhe," *Die Baugilde* 11 (1929): 176–78.

(10) Otto Haesler, "Grundsätzliches zum Wohnproblem," *Die Baugilde* 11 (1929): 1660–62, esp. 1660, emphasis in the original.

(11) Hans Schmidt, "Vorwort," in Otto Haesler, *Mein Lebenswerk als Architekt* (Berlin: Henschel, 1957), IX.

(12) Paul Schmitt, "Die Besonnungsverhältnisse an Stadtstrassen und die günstigste Blockstellung," *Zeitschrift für Bauwesen* 80 (1930) 5:109–24, esp. 109.

(13) Ibid, 117.

(14) Ibid, 109.

(15) Ludwig Hilberseimer, "Raumdurchsonnung," *Moderne Bauformen*, 34, (1935): 29–36.

(16) Otto Haesler, *Mein Lebenswerk als Architekt* (Berlin: Henschel, 1957), 5.

(17) Magistrats–Oberbaurat Koeppen, "Allgemeine Betrachtungen zum Wettbewerb," *Zeitschrift für Bauwesen* 79 (1929) 4: 79–81, esp. 80.

(18) "Vorbemerkung der Schriftleitung," *Zeitschrift für Bauwesen* 79 (1929) 4: 79.

(19) Konstanty Gutschow, "Aus dem Eräuterungsbericht," *Zeitschrift für Bauwesen* 79 (1929) 4: 103.

(20) Georg Lüdecke, "Südbelichtung der Wohnräume im Einfamilienhaus," *Die Baugilde* 1930, 1480–85, esp. 1480.

(21) Ibid., 1485.

(22) Ludwig Hilberseimer, "Raumdurchsonnung," *Moderne Bauformen*, 34, (1935): 29–36.

(23) Hans Plessner, "Aus der Geschichte des Sonnenbaus," *Beilage zum Baumeister* 29 (1931) 9, B157-158, esp. B157.

(24) Adolf Behne, "Dammerstock," *Die Form* 5 (1930) 6: 163–66, esp.165.


## 7. IMAGE SOURCES

1: Orell Füssli.

2, 3, 4, 5, 8, 26: Google Earth.

6, 7: Henry-Russell Hitchcock and Philip Johnson, *The International Style: Architecture since 1922* (New York: Norton, 1932), 152.

9, 10, 11: Angela Schumacher, *Otto Haesler und der Wohnungsbau in der Weimarer Republik*, (Marburg: Jonas Verlag, 1982), 403-04.

12–17: *Die Baugilde* 11 (1929): 176–78.

18–20: *Die Baugilde* 11 (1929): 1660.

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24–25: *Die Baugilde* 1930, 1482–82.