

The Sun for All: Social Equity and the Debate on Best Solar Orientation of High Modernist Housing

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ABSTRACT: The Modern Movement of the 1920s developed a preferred housing scheme that arranges parallel building rows running from north to south, with bedrooms facing east and living rooms facing west. This strict orientation scheme—known as Zeilenbau (row building)—was more or less unanimously shared among the architects of High Modernism. However, their arguments for Zeilenbau varied widely: improved hygiene; cost reduction in the building industry; accommodating the day rhythm of working families; implementing scientific investigations in the design process; aesthetics; and others. This paper focuses on the discussion about the relationship of social equity and best sun orientation by studying particularly one proponent of this argumentation: Hannes Meyer. Investigating the controversy on sun orientation in High Modernist architectural discourse can help us reflect today's newly occurred debate on strict building orientation with its very different emphasis on energy efficiency.

1 INTRODUCTION

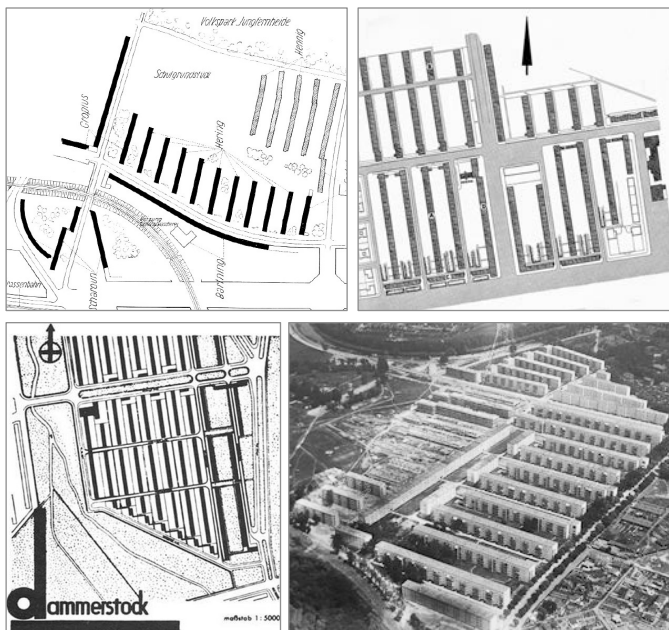


Figure 1-4. Left to right: Siemensstadt (Berlin) 1929, Hellerhof (Frankfurt) 1929, Dammerstock (Karlsruhe) 1929, and Haselhorst (Berlin) 1929.

Throughout architectural history, from antiquity to today, we find a clear preference to orient main spaces in residential buildings toward south (in the northern hemisphere). Spaces with south windows receive the most sunlight in winter and the least sunlight in summer, which is for both seasons the preferred case. However, the Modern Movement of the

1920s developed a preferred housing scheme that orients spaces to east and west—with bedrooms facing sunrise and living rooms facing sunset. This strict orientation scheme—known as Zeilenbau (row building)—was shared more or less unanimously among modern architects, including Walter Gropius, Ernst May, Walter Schwagenscheidt, Hannes Meyer, Ludwig Hilberseimer, Otto Haesler, Le Corbusier, Mart Stam, and the wider circle of CIAM members. Particularly around 1929, many Zeilenbau schemes were built, such as Siemensstadt (Berlin) 1929, Hellerhof (Frankfurt) 1929, Dammerstock (Karlsruhe) 1929, and Haselhorst (Berlin) 1929 (fig. 1-4).

The arguments for this orientation varied widely, giving us a first indication that justifying a scheme that contradicted the common orientation of many centuries was not easy. These argumentations were embedded in the broader topics of the time:

- Improved hygiene: Hygienic living 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 (165).
- Implementing scientific investigations in the design process: Basing architecture on increased knowledge of sociology, psychology, technology, construction processes, environmental studies (wind direction, daylighting, noise) served as justification of building form. Studying the people’s general “life processes” (Gropius 1988: 114;

- c) Social equity: People of all classes should have equal access to sunlight; Zeilenbau guaranteed that everybody living in those row buildings received that.
- d) Building for the masses: Accommodating the day rhythm of working families, sunlight was demanded to be in bedrooms to the east when workers got up, and in the living room to the west when they came home from work.
- e) Aesthetics: Despite the fact that most modern architects denied a formal approach to architecture, a repeated formal language can be found in many Zeilenbau estates. Only few architects tried to justify Zeilenbau aesthetically, for example Georg Lüdecke, who stated that in an east-west running building with the main spaces facing south and the northern rooms—kitchen, bathroom, staircases, etc.—having less room depth, a building became thinner. He argued that a multi-family house with bedrooms and living rooms facing only south "would look too thin with its low building depth" (Lüdecke 1930: 1480).
- f) Cost reduction in the building industry: 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" (Lüdecke 1930: 1480).

2 SUN EXPOSURE AS A CLAIM FOR SOCIAL EQUITY

dew that moisten it” (Howard 1902: 16, 13). In his famous diagram of “The Three Magnets” he mentions “foul air” and “murky sky” as disadvantages of the town, and “fresh air” and “bright sunshine” as the advantages of the country (fig. 5). Obviously, the Garden City, as the combination of town and country, was intended to combine all advantages. However, Howard’s book was about socio-economic aspects of urban planning. Best orientation of housing was not addressed in his version of the Garden City, but instead the proportion of streets, “so wide and spacious that sunlight and air may freely circulate” (Howard 1930: 39).

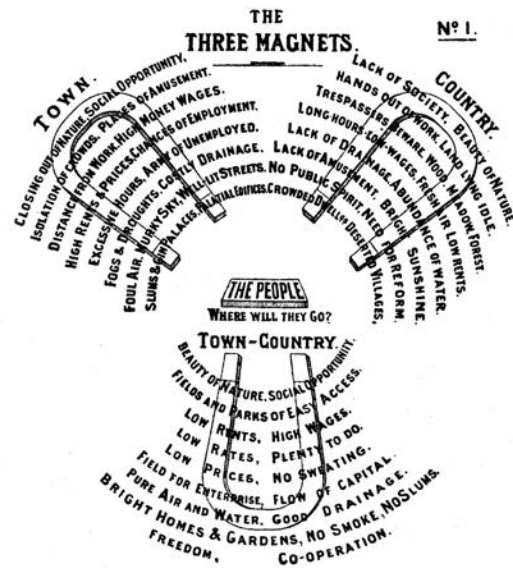


Figure 5: Ebenezer Howard, Garden Cities of To-Morrow.

3 EARLY ZEILENBAU: OTTO HAESLER

Also twenty years after Howard's *Garden Cities of To-Morrow* we can frequently read the general demand for "sun, light, and air," but the question of best orientation of housing did not come to the fore before the second half of the 1920s. One of the earliest housing schemes that focused on orientation and propagated Zeilenbau was Otto Haesler's Georgsgarten in Celle, Germany, in 1926-27 (Poerschke 2015). Haesler's main argument for this orientation was that sun should be in rooms exactly when people used them: bedrooms in the morning, living spaces in the evening. Over the course of only a few years, his building layouts became more and more specialized by providing small sleeping cells to the east and bigger family rooms to the west (fig. 6-7). Such layouts did not allow flexible uses and had to be used very much in exactly the intended way. Voices more radical than Haesler claimed that the masses could be educated by such layouts. Fritz Block, for example, stated in 1927 that a strict designation "of all rooms in small apartments should be carried out wherever possible." For Block, this seemed particularly necessary "for the large mass of

the working people that must be educated and influenced. [...] The worker is highly skeptical of the liberating feeling that we wish him to achieve by new building“ (Block 1927: 46, 41). Equally, Adolf Rading stated that “there is no purpose anymore of asking occupants; they do not know their needs anymore. [...] Therefore it is urgent, as a first step, *on a purely human and social basis and in concert with the economic situation, to determine the housing needs and to build apartments accordingly*” (Rading 1927: 47, emphasis original).

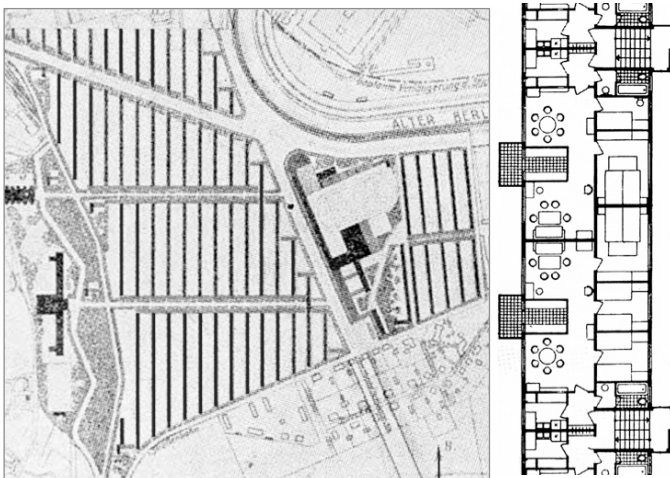


Figure 6-7. Otto Haesler and Carl Völker, entry for the 1929 Haselhorst competition, fourth prize, site and typical floor plan.

4 HANNES MEYER

Hannes Meyer (1889–1954) stands out as one of the architects of Modernism with strong social ambitions. Already early in his career he was intensively engaged in social questions of housing and urban planning. He was active in the Swiss land reform movement and joined a building cooperative. In 1912/13 he moved to England to live for a year with a relative near London. He visited garden cities such as Letchworth and worker model villages such as Bourneville and Port Sunlight (the latter's name stemming from a popular product of the Lever Company and not from an utopian urbanistic idea of access to sunlight). Before and after England Meyer worked on housing projects such as the working-class estate Garden City Grünau in the office of Johann Emil Schaudt (1911-12); the estates Margarethenhöhe, Garden City Hüttenau, and the workers estate Breitenborn in the office of Georg Metzendorf (1916), and several other housing complexes while working in the building administration of the Krupp company (1916-18). He also worked during the first half of the 1920s for several non-profit housing corporations (Winkler 1989). All of this laid the basis, as he later stated, “to regard works of art, architecture, or urbanism never outside of the social foundations, from which they emerge” (Meyer 1980: 346).

The first housing estate he built under his name was the Freidorf estate in Basel, which he started designing in 1919. After its completion Meyer lived in Freidorf from 1921 to 1926. The orientation of the town houses did not seem to play a bigger role in this scheme (fig. 8). The estate avoids any building blocks and consists entirely of rows parallel to the streets, leading to gardens oriented to the south-east and north-west. Creating symmetric streets and geometric squares was obviously of higher importance than the best sun orientation of the garden or house. Stated in other words, one can also say that the appearance of the whole seemed to be more important than the optimization of the single part. Meyer described in 1925 the Siedlung Freidorf, with its parallel building rows of almost the same appearance and a centered community area, to be a symbol of “simplicity, equity and truthfulness.” However, in the same article, he criticized Freidorf already as “a compromise; socially between individual and community, formally between city and countryside” (Meyer 1925: 49, 51).



Figure 8: Freidorf estate by Hannes Meyer 1919-24.

In 1926 Meyer started a partnership with the architect Hans Wittwer (1894–1952). According to Klaus-Jürgen Winkler, it was Wittwer who brought into the partnership not only excellent design skills, but also a broad knowledge of technologies, and particularly of daylighting, that was quickly taken up by Meyer (Winkler 1989: 61). Two spectacular competition of this partnership became famous, both of which emphasize solar orientation: the 1926 Petersschule (St. Peter's school) in Basel (fig. 9) and the 1927 League of Nations Building in Geneva (fig. 10-11). Both of them have the building wings with classes and offices run strictly from north to south with orientation of the rooms to east and west.

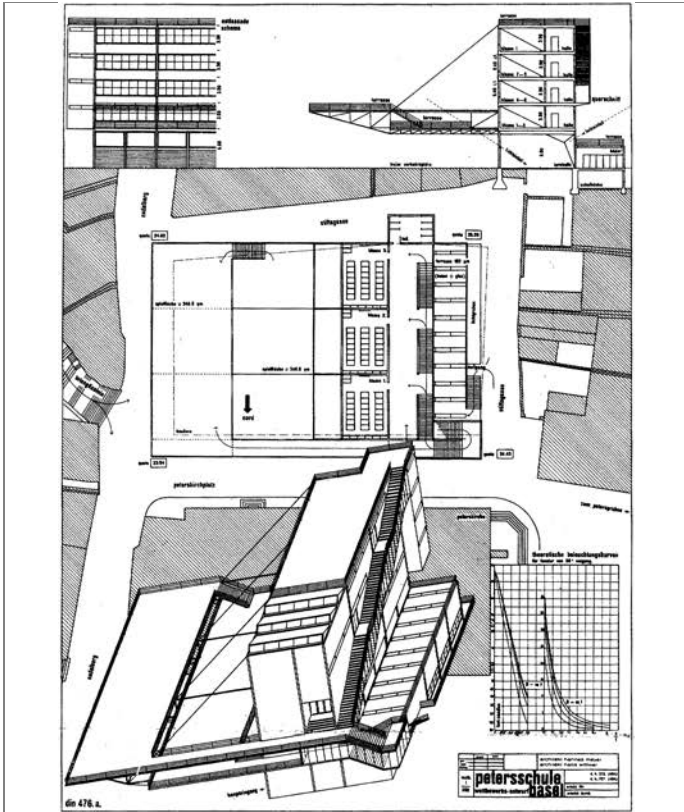


Figure 9: Competition Entry for the Petersschule in Basel with illumination graphs.

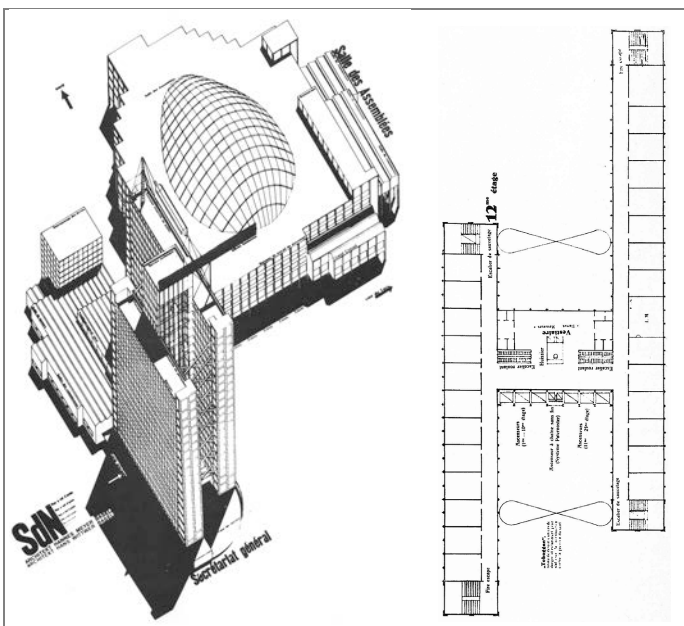


Figure 10-11. Competition entry for the League of Nations Building in Geneva. Isometric view and floor plan of office wing. The office building runs strictly north-south.

In the journal *bauhaus* the Petersschule project was presented in revised form and included illumination graphs and extensive daylight calculations. For the office wing of the League of Nations Building Meyer and Wittwer asserted that the floor height was “calculated from the illumination coefficient of the work surface” and that the entire complex “was only result of traffic diagrams, lighting diagrams, insolation diagrams” (Meyer 1927: 6). Both projects claimed that building for a new society necessitates

ideal east and west orientation, and, vice versa, that ideal orientation expresses a new society.

At the same time, in 1926, Meyer published in the journal *Das Werk* his first famous pamphlet, “Die Neue Welt” (The New World) which provided an enthusiastic vision of society. Meyer claimed that the “demands we make on life today are all of the same nature depending on social stratification. The surest sign of true community is the satisfaction of the same needs by the same means. The upshot of such a collective demand is the standard product. [...] The degree of our standardization is an index of our communal productive system” (Meyer 1928: 93). Two arguments were used here: Meyer stated clearly the architect’s task to build for the people’s needs, which implied, on the one hand, that “the people” had similar needs that could be verified through research, and, on the other hand, that it was the obligation of the hour that architects think of themselves as being a part of that same people. These ideas of equity of people and subordination of the individual under the community, both expressed in standardization, were themes that he carried further and combined with daylighting and other environmental studies. In his pamphlet “bauen” (building), published 1928 in the journal *bauhaus*, Meyer reached a stage where he embraced Wittwer’s knowledge on solar orientation and daylighting and related it to his own vision of society:

“[...] in its basic design the new dwelling house becomes [...] a biological apparatus serving the needs of body and mind. [...]”

1. sex life 2. sleeping habits 3. pets 4. gardening 5. personal hygiene 6. weather protection 7. hygiene in the home 8. car maintenance 9. cooking 10. heating 11. insolation 12. service

these are the only requirements to be considered when building a house. we look at the daily routine of each person living in the house and this gives the function diagram for father, mother, child, infant and other occupants. [...]

we calculate the angle of the sun’s incidence in the course of the year and in relation to the latitude of the site, and with this knowledge we determine the size of the shadow cast by the house in the garden and the amount of sun admitted by the window into the bedroom. we work out the amount of daylight falling on the working area of the interior and we compare the heat conductivity of the outside walls with the humidity content of the outside air. [...] where color seems psychologically indispensable, we include its light reflecting value in our calculations. [...] we consider the body of the house to be an accumulator for the heat of the sun ...

moreover, as one of the final forms in which the welfare of the nations is to be realized, the new

housing estate is a purposively organized work which engages the energies of all and in which co-operative effort and individual effort join forces in a common cause. [...] in it the tensions of the individual, the sexes, the neighborhood and the community and the geopsychical relationships have been deliberately patterned." (Meyer 1928: 95-97)

This longer quote summarizes three themes that clarify Meyer's vision of architecture in its relatedness of daylighting (among other technologies), the individual and the society. First, Meyer demanded the study of the day rhythm of typical individuals; second, he demanded technical investigations on the environmental context; and third, he proposed that connecting both is a step to achieve an architecture for a new society.

5 BAUHAUS TEACHING

In 1927 Hannes Meyer became Bauhaus Meister, and in 1928 the director of the Bauhaus. In Meyer's tenure many student assignments incorporated diagramming of sun positions and the insolation and shading within rooms. These were not restricted to housing designs but were also included, for example, when designing school projects. Meyer hired Hans Wittwer who started in the second half of 1927 teaching environmental technology in architecture, including lighting, heating, ventilation, and installation. Many solar analysis assignments resulted from this teaching, such as the one by Lothar Lang (fig. 12) (Winkler 2003, Kieren 1989). Meyer himself taught "analytical building," part of which was the study of the family members' day rhythms. Meyer's and Wittwer's courses, together, resulted in the reciprocal connection between the topics of daylighting and social architecture. This combination also led to the organization of many spaces—class rooms, hotel rooms, and rooms within apartments—to be oriented to east and west, saying that direct solar exposure was wanted exactly when people used particular spaces.

The building projects and competitions undertaken in these Bauhaus years showed sun and lighting studies everywhere. The most famous example was the school of the ADGB (Federation of German Trade Unions) completed in 1930 (fig. 13-15). A housing example is the extension of the Törten estate. The first part of this estate was designed and built under Walter Gropius's directorship, with the main focus being on industrial fabrication of standardized building elements, while lighting consideration did not play any role. In the second building phase under Meyer (1928-30), streets were organized to run from north to south. Single-family houses paralleled these streets and were designed in three different types as detached, angle-shaped and

row houses; they were eventually not built (fig. 16-17). In contrast to the single-family houses, multi-family apartment buildings accessed through balconies were turned ninety degrees. In these three-story buildings, all living spaces and bedrooms faced south, while bathrooms, kitchen, the balcony access and stair faced north (fig. 18). The Bauhaus building department was able to complete four of them.

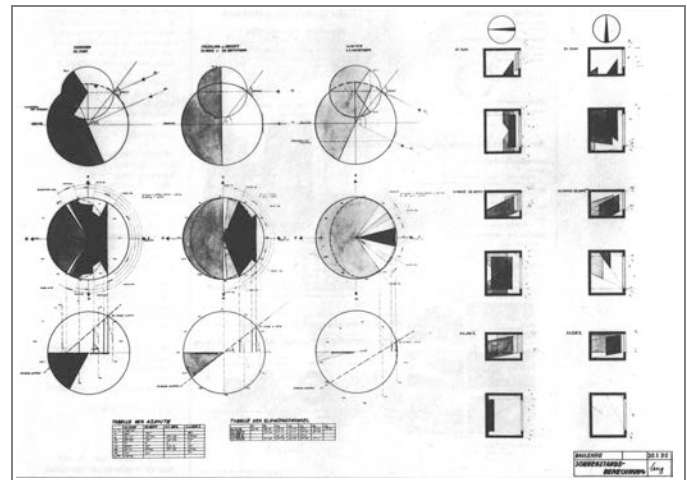
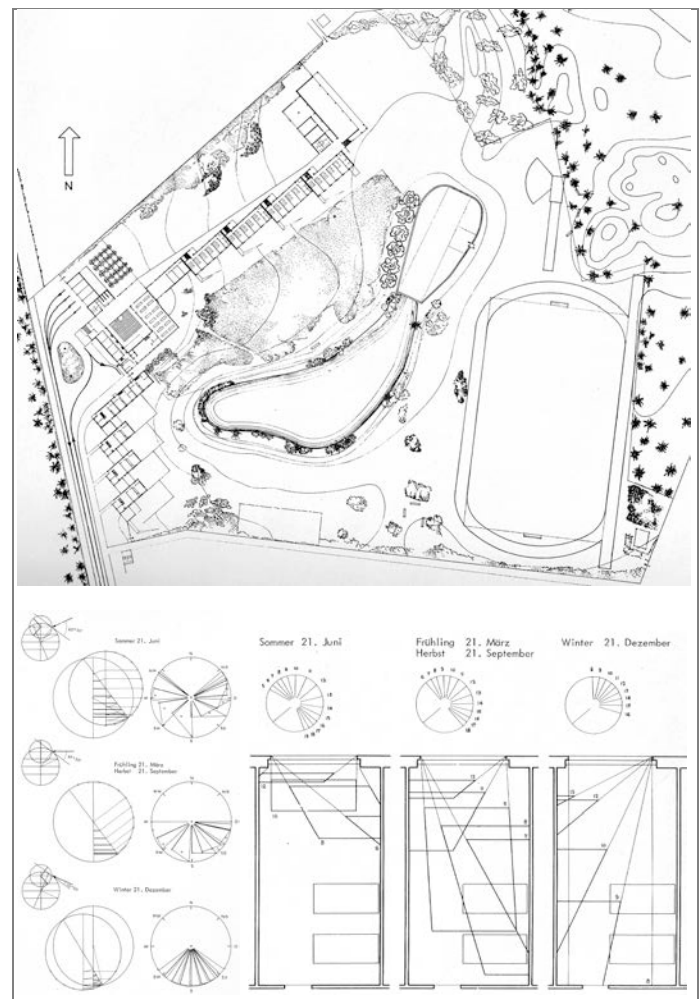


Figure 12: Bauhaus student Lothar Lang's analysis of direct sun and shadowed areas in rooms with different orientations. Assignment for Hans Wittwer's class.



Figures 13-15. Hannes Meyer, Hans Wittwer, and Bauhaus students. School of the ADGB (Federation of German Trade Unions) in Bernau, completed 1930. Site plan and sun studies for bedrooms.

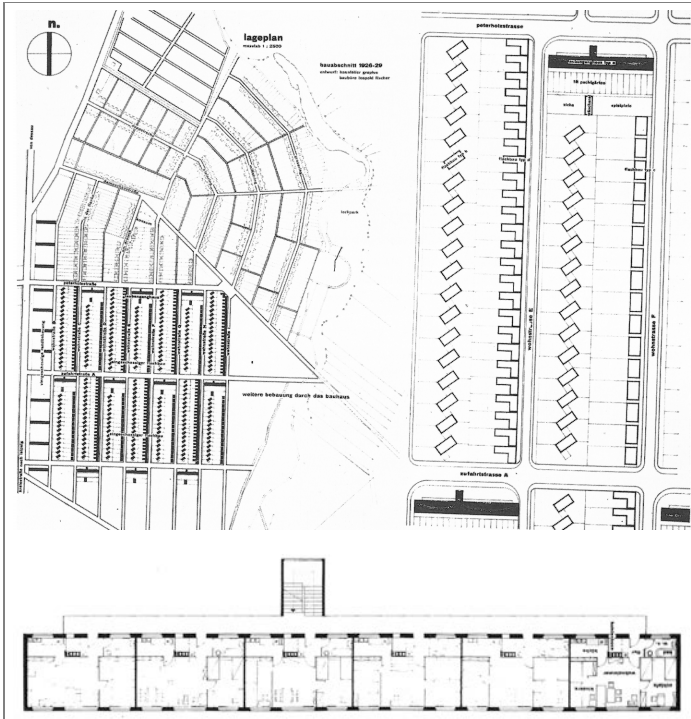


Figure 16-18. Hannes Meyer and Bauhaus students. Törten estate, second phase, completed 1930. Site plan, detail, and floor plan of balcony-accessed multi-family building. Only four of these apartment buildings were built in the second phase.



Figure 19. Ernst May: Westhausen estate 1929-31. Single-family row houses run in north-south direction (front of photo); the four-story multi-family apartment buildings with balcony access are at the main street (back of photo).

Mixing north-south running single-family row houses with east-west running balcony-accessed multi-family apartment rows could be seen in several other modern housing estates, for example, in Ernst May's Westhausen estate of 1929-31 (fig. 19). The two building types were considered to be complementary to each other. Better cost-effectiveness might have been the strongest argument for the balcony-accessed buildings. The two types provided some social mix of occupants while keeping the standard equal for both of them. With respect to lighting it was emphasized in the description of the Törten estate that no north-facing bed- and living rooms were designed in order to "guarantee the greatest possible insolation of the whole apartment" while the serving rooms (hallway, bath and kitchen) "isolate the unit from the traffic on the balcony and from rough

northern weather impacts" (quote from 1930, in Winkler 2003: 83). It should also be mentioned that, under Meyer's direction, from 1928 on, several architects started teaching in the architecture program, such as Ludwig Hilberseimer, Mart Stam, and Anton Brenner. Hilberseimer and Stam had strong urban design expertises, including Zeilenbau, and certainly influenced the designs and orientation schemes of housing estates undertaken by the Bauhaus students.

Meyer's justification for Zeilenbau and rooms facing to east and west was eventually not only one of social equity, but, even further, of achieving a collectivist society. Also Hilberseimer believed in this collectivist approach, when he wrote in his book *Groszstadt Architektur* that the "building of housing, particularly of mass housing, is not subject to individual but to collective design" (1927: 25).

The approach to equity in a collectivist society takes a scientific route: since all people should be treated the same way, sciences need to find out what the best orientation for all people is. In other words: not only equity but one with an appropriate standard. All people should have apartments with orientations that are scientifically justified and the studies of sun orientation were understood to be an example of a scientific approach to architecture. Part of that were the empirical studies of the people's "life processes" (Meyer 1928: 13), from which insights for design orientation could be gained.



Figure 20. Hannes Meyer, Development plan for Sozgorod Gorki, Soviet Union, 1932.

After his dismissal from the Bauhaus in 1930, Hannes Meyer lived in the Soviet Union until 1936, where he found new opportunities to conceptualize

large housing estates and even whole industrial towns. One example is the development of the industrial town Sozgorod Gorki near Molotov in 1932. Planned for 45.000 people, the design for the town consisted mainly of north-south running building rows. Some of them were turned ninety degrees—similar to the balcony-accessed multi-family houses in Törten—in order to create spatial rhythm, emphasize the street, or connect outdoor spaces between rows to natural areas. Where such building rows followed east-west streets, they were never positioned on the north side of the streets, which would have led to opening the apartments to northern gardens. Also, topography played a role in situating and sizing different functions (fig. 20).

Ten years later, after Meyer relocated to Mexico, he had the opportunity to develop another large housing estate for 11.000 workers, the 1942/43 estate Lomas de Becerra (fig. 21) (Möller 2015: 66; Schier 1989: 32). The strict scheme of north-south running buildings had again not changed here. While Meyer was very critical of many endeavors of his Bauhaus time, the analyses and findings related to sun orientation were not called into question.

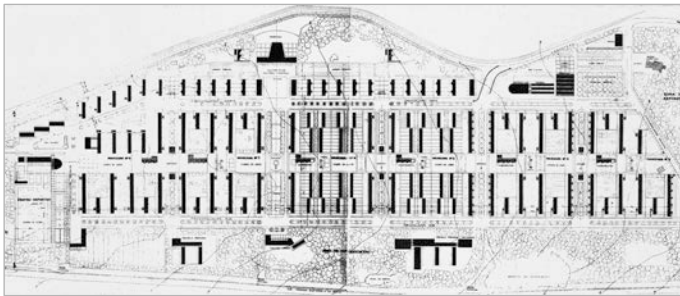


Figure 21. Hannes Meyer, Development plan for Lomas de Becerra, Mexico, 1942.

6 CRITICAL COMMENTS: ADOLF BEHNE

The architecture critic and social activist Adolf Behne (1885-1948) commented in the late 1920s and early 1930s on the Zeilenbau housing projects and addressed in particular the topic of sun orientation that he identified as a dogma of the time. In contrast to so many architects who requested the subordination of the individual under the collective society, he emphasized individual freedom and the right to choose the sun orientation he or she prefers. We see here again the connection of sun orientation and the social, however here with regard to individual freedom within society rather than the subordination of the individual under the collective. Behne concluded that no single orientation preference could ever be the ultimate ideal for housing and that instead a variety of orientations are necessary to serve the diverse lifestyles of a society. The controversy shows that the solar orientation debate went far beyond technical questions and instead targeted

the core question of social meaning in architecture, which addresses the balances of the individual and society. Behne stated in 1930: "Social complexity demands a variety of building orientations." On the occasion of a critic he wrote on what became the most famous Zeilenbau estate, the Dammerstock, he explained his concerns regarding strict orientation schemes:

"Dammerstock would be right if our wind rose had only east and west, if the sun went back and forth between east and west on the shortest way, without touching north and south. But since the sun, from man's view, marks four cardinal points, which deeply became part of our consciousness, Dammerstock seems to be a torso. [...] According to the most consequential architect, man has to go to bed toward the east, has to eat and answer mother's letter toward the west, and the housing unit is organized in a way that he cannot make it differently. [...] The housing unit that is too specialized does not gain value of living, it loses it. [...] Dammerstock's method is a dictator's method; it is the method of an either-or." (Behne 1930: 164)

While Behne criticized in this quote the orientation dogma of the 1920s and 1930s, his actual critic targeted the question of flexibility of how to occupy rooms in an apartment. The floor plans of modernist housing were highly specified and did not allow changing uses when needed.

7 FINAL REMARKS

Adolf Behne warned in 1930 that the schematic and monotonous layout of building rows with preset room assignments does not reflect the society altogether. This critique is applicable to all dogmatic orientation discourses, no matter which direction rooms are eventually facing. The example of modernist Zeilenbau can help us in today's newly occurred debate on building orientation. In light of energy efficient building, architects have returned to the preference of south orientation for all bed- and living rooms for the one, purely technical reason of energy reduction. As in High Modernism, architects are convinced that there is only one possible orientation, particularly for housing: this time, however, to the south. As in High Modernism, the argumentation is straightforward and directly related to one of the most relevant questions of the day: this time, however, it is about an environmental vision. And one is left with the same task of how to transcend and elevate this technical approach toward meaningful architecture.

8 REFERENCES:

- Behne, Adolf. "Dammerstock." *Die Form* 5 (1930) 6: 163-166.
- Block, Fritz. "Wohnform und Wandlungsfähigkeit," *Die Form* 2 (1927) no.2: 40-46.
- Gropius, Walter. *Ausgewählte Schriften*. Berlin: Ernst, 1988.
- Jacques Gubler: "Hannes Meyer's Freidorf-Siedlung Muttentz," *Werk* 4/73: 462-474 and 487.
- Hilberseimer, Ludwig. *Groszstadt Architektur*. Stuttgart: Hoffmann, 1927.
- Howard, Ebenezer. *Garden Cities of To-Morrow*. London: Swan Sonnenschein, 1902.
- Lüdecke, Georg. "Südbelichtung der Wohnräume im Einfamilienhaus," *Die Baugilde* 1930, 1480-85.
- Meyer, Hannes. *Bauen und Gesellschaft. Schriften, Briefe, Projekte*. Dresden: VEB Verlag der Kunst, 1980.
- Meyer, Hannes, *Bauten, Projekte und Schriften. Buildings, projects and writings*, edited by Claude Schnaidt, Teufen: Niggli 1965.
- Meyer, Hannes. "Bauen." *bauhaus* 2 (1928) 4: 12-13.
- Meyer, Hannes. "Ein Völkerbundgebäude für Genf." *bauhaus* 1 (1927) 4: 6.
- Meyer, Hannes. "Die Siedlung Freidorf." *Das Werk* 12 (1925), no. 2, 40-51.
- Möller, Werner (ed.). *das prinzip coop – Hannes Meyer und die Idee einer kollektiven Gestaltung*. Leipzig: Spector 2015.
- Poerschke, Ute. "Solar Buildings in the 1920s. The Discourse on Best Sun Orientation in Modern Housing." *Proceedings of SOLAR 2015*. University Park: The Pennsylvania State University, 2015.
- Rading, Adolf "Wohngewohnheiten," *Die Form* 2 (1927) no.2: 47-49.
- Schier, Luise. "Nachlass Hannes Meyer," *Form und Zweck* 21 (1989) no.4: 30-31.
- Suter, Ursula. "The 'Neues Bauen' by Other Means – the International Building Brigades in the Soviet Union," *Daidalos* 54/1994: 42-51.
- Winkler, Klaus-Jürgen, *Der Architekt hannes meyer. Anschauung und Werk*. Berlin: VEB Verlag für Bauwesen 1989.
- Winkler, Klaus-Jürgen, *Baulehre und Entwerfen am Bauhaus*. Weimar: Universitätsverlag, 2003.