

Hannes Meyer's Scientific Worldview
and Architectural Education at the Bauhaus (1927-1930)

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Abstract

Although the Bauhaus's second director, Hannes Meyer (1889-1954), as well as some of the graduates whom he taught, have been much discussed in previous literature, little is known about the architectural education that Meyer shaped during his tenure. He incorporated key concepts from biology, psychology, and sociology, and invited specialists from a wide variety of fields. The Bauhaus under Meyer was committed to what is considered a "scientific worldview," and this study focuses on how Meyer incorporated this into his theory of architectural education. This study reveals the following points. First, Meyer and his students used sociology to design analytic architectural diagrams and spatial standardizations. Second, they used psychology to design spaces that enabled people to recognize a symbolized community, to grasp a social organization, and to help them relax their mind. Third, Meyer and his students used human biology to decide which direction buildings should face and how large or small that rooms and windows should be. Finally, Meyer's unified scientific worldview shared a similar theoretical structure to the "unity of science" movement, established by the founding members of the Vienna Circle, at a conceptual level.

Keywords: Bauhaus, Architectural Education, Sociology, Psychology, Biology, Unity of Science

Introduction

In 1920s Germany, modernist architects began to incorporate biology, sociology, and psychology into their architectural theory based on the concept of “function” (Gropius, 1929; May, 1929). The Bauhaus’ second director, Hannes Meyer, was one of them. Meyer redefined his functionalism theory by adding sociology, psychology, and biology, and taught architectural theory at the Bauhaus that attached importance to scientific analyses (Winkler, 2003). The special lecturers whom Meyer frequently invited to the Bauhaus accelerated this tendency (Winkler, 1989). On the relationship between sciences and architectural spaces, many researchers highlight the psychological, social, and biological factors in the design of Meyer’s ADGB Trade Union School in Bernau, Germany (Tomita, 2008). Moreover, science historians such as Peter Galison clarified that the Bauhaus had a close relationship to the “the unity of science” movement in that the latter was a thread within the philosophy of logical positivism that organized all sciences as a consistent system based on physics (Galison, 1990; Blume, 1993; Dahms, 2004). However, it has not been discussed how Meyer and his students translated the results of scientific analyses to architectural spaces. Therefore, this study reveals Meyer’s scientific worldview and how he incorporated it into the theory of architectural education that he espoused while at the Bauhaus through the analyses of the design method in Meyer’s representative work [Fig.1] as well as a project by Meyer’s students Philip Tolziner and Tibor Weiner [Fig.2]. In each section below, sociology, psychology, biology, and the unity of science in these two representative works are discussed on their theoretical background. Of particular interest are published



Fig.1 ADGB Trade Union School (1928-1930) by Hannes Meyer (“Zentralblatt der Bauverwaltung”, 51. Jahrgang 1931, Nummer 14)

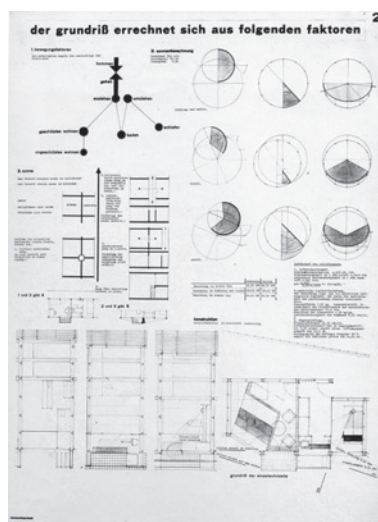


Fig.2 Communal housing for factory workers of the socialist state (1930) by Philip Tolziner and Tibor Weiner, Sheet no. 2. (Bauhaus Universität Weimar)

and unpublished materials: the drawings and documents produced by Meyer and his students held in the Deutsches Architekturmuseum and Bauhaus Universität Weimar.

The “Small Circle System”

Sociology in Meyer’s Scientific Worldview

Meyer used sociology to design social organizations within architecture. In his representative work, the ADGB Trade Union School (1928-1930), a training school for the members of ADGB (der Allgemeine Deutsche Gewerkschaftsbund) in the pine wood forest of Bernau, near Berlin, Germany, Meyer designed the social organization of attendees by using a “small circle system” expressed in architectural form. In this project, the fundamental units (i.e., small circles) comprised five double rooms on one floor, accommodating 10 trainees. These were then stacked vertically to create a three-story building. Ultimately, four of these three-story buildings created the “big circle” that accommodated 120 trainees (Schnaidt, 1965). In short, in this project, Meyer designed a social organization by making groups of the same type of rooms.

To understand the relationship between social organization and architectural spaces, Meyer’s 1933 essay “How I work” (*Wie ich arbeite*) is indispensable. Within, Meyer explained his analyses and design method in the following four stages:

Stage 1: Diagrammatic representation of the building program, in which spaces of a similar kind are grouped together and the analytic features indicated (usually on a scale of 1:500 or 1:1000)

Stage 2: Standardization of all similar spaces and establishing standard “types” for all vitally important individual spaces (on a scale of 1:100 or 1:200). During this stage, the results of the overall analyses are collated.

Stage 3: Diagrammatic planning of the entire building program on a uniform scale (usually 1:500) showing organization and the most appropriate grouping of spaces as well as the connections between them.

Stage 4: Strict observation of the building organization plan, working from the aforementioned draft, considering all economic, technical, and architectural factors. The draft plan is drawn on the smallest possible scale and in a tersely standardized form.

This description can be considered a method with which to translate sociological analyses into architectural space. As such, the meaning of Meyer’s small circle system can be examined through the ADGB school.

Following Stage 1, where similar kinds of spaces are grouped together, Meyer adopted this idea in the design of the ADGB school to structure the trainees’ social organization by using the small circle system. Adhering to Stage 2, Meyer designed the standardized fundamental units as being small circles, or a double room, which lays down a standard type for all vitally important individual spaces. In Stage 3, Meyer determined the diagrammatic plan of the entire building program, which has a characteristic staggered form.

In the design process of this building, the small circle system was adopted consistently, and the fundamental structure was not changed, even over the course of three different plans: the competition plan (drawn April 1928), architectural application plan (drawn August 1928),

and executed plan (drawn May 1930) (Tomita, 2008).

Sociology in Meyer's Architectural Education

Meyer considered that sociology was an important consideration in the field of architecture, and thus introduced sociological analyses in his architectural instruction at the Bauhaus from the beginning of his tenure. His method of teaching is regarded as an early example of introducing sociological analysis into architectural education, alongside that of Bruno Taut's at Technische Hochschule Berlin (Winkler, 2003). Otto Neurath (1882-1945) played a key role in the introduction of sociology to the Bauhaus (Schäfers, 2003). Neurath was a social scientist and scientific philosopher in Vienna, Austria, and his particular discipline did not discriminate between natural science and social science.

In some of students' architectural works, many sociological analyses that are clearly fruits of Meyer's architectural education are identifiable. Students were often tasked with drawing analytical diagrams and timetables of life (Tomita, 2016). One of the most significant student works during Meyer's era was a communal housing for factory workers of the socialist state (1930) by Philip Tolziner and Tibor Weiner:

...it was tried to draw easy ascertainable basis and thought, which was the beginning point of our project: the new social order, the relationship among human beings and to nature, the condition of inhabitants' daily routine.

(Tolziner, 1989)

Psychological Effect in Architectural Space

Psychology in Meyer's Scientific Worldview

As mentioned in the previous section, Meyer created the entire social organization of the ADGB Trade Union School based on sociological analyses. In addition, based on psychological analyses, he designed a community building and the glazed corridors of the school as important spaces for the school community.

First, let us discuss the community building: it contains a main entrance, auditorium, and dining hall, and symbolizes the unity of the school community. At main entrance are three oil-fired chimneys as the heating system. They demonstrate practical functional form, while simultaneously symbolizing the labor movement: cooperative, trade union, and party (Nerdinger, 1989). The auditorium is square in shape. According to Meyer (1928), "Next to the (acoustic disadvantageous) circle, this square is the strongest possible expression of the unity, the social unity of a community."

Second, we shall discuss the glazed corridor: it is the main path of circulation in the school. It connects the community building, dormitory building, and school building. Meyer designed the glass corridor by considering orientation and relaxation in mind (Tomita, 2008). According to his explanation of the competition plan (April 1928), Meyer explained a psychological effect wherein people subconsciously acknowledge social organization through the impression caused by the space composition (Meyer, 1928b); similarly, in his explanation of the execution

plan (May 1930), Meyer also explained a psychological effect that causes people to be in good humor upon viewing the landscape:

Public rooms providing facilities for exercise and recreation were designed in a variety of ways as part of the general plan to organize the psychological background of the 120 students. During rainy periods lasting several days, good humor was preserved by ensuring there were plenty of things for the students to do and that their view of nature outside continually changed. It was with this in mind that the main glazed corridor was designed on an incline with re-entrant corners and glass walls affording a view of the school as a whole while other windows brought the beholder into contact with nothing but forest and nature.

(Meyer, 1930)

To understand the background of these intentional psychological effects in the architectural space, Meyer's memorandum for a lecture at Wien (Meyer, 1929a), at the invitation of the Vienna Circle members, is helpful. Meyer prepared a nine-page memorandum for this lecture dated 22 April 1929 and stated that he attached importance to psychological matters in architecture.

He initially described architecture as a life process involving three types of organization: technical-mechanical, economical, and sociological. He also highlighted the works of following architects: Ernst May, Walter Gropius, Martin Wagner, Leberecht Migge, Fugo Häring, Otto Haesler, and Martin Mächler. Meyer emphasized that architecture is not only technical/economical/sociological, but also a psychological organization, in an attempt to differentiate his definition from other architects'. This definition can be seen in Meyer's text *Building* (1928).

May and Gropius began to consider psychological aspects during the second Congrès internationaux d'architecture moderne (CIAM) conference in October 1929; however, Meyer's attention to psychology was earlier than other contemporary architects, and Meyer was conscious of that.

Psychology in Meyer's Architectural Education

Meyer invited psychologists Hanns Prinzhorn (1886-1933) and Karlfried Graf von Dürckheim (1897-1989) to the Bauhaus as special lecturers during his tenure. Prinzhorn's lecture themes were "body-mind-unity" (*leib-seele-einheit*; also the title of his book) and "foundation of new personality psychology" (*grundlagen der neuen persönlichkeitspsychologie*). Dürckheim's lecture was mainly about Gestalt psychology, as revealed in the notes of Howard Dearstyne, a Bauhaus student (Dearstyne, 1930/31).

According to Winkler (1989): "Meyer evaluated cognitive function of modern science very highly, therefore psychology took a special palace in his thoughts." This psychological effect is evident in the architectural spaces designed by his students.

In Tolziner and Weiner's communal housing for factory workers of the socialist state, the architectural form's minimum unit of social organization (a single dwelling unit) can be recognized easily, because the convex corners appear in both the corridor side and veranda side and are inclined on a North and South axis with gaps (Figure 2. Tomita, 2016).

Biological Analysis and the Bauhaus

Biology in Meyer's Scientific Worldview

As mentioned in the previous two sections, Meyer's designs focused on social organization and community space within the ADGB Trade Union School, and these were based on sociological and psychological analyses. However, two questions remain unanswered: how did the architect arrange the school buildings on the unique landscape, and how did he design the windows as interfaces between humans and the landscape? Meyer used humans' biological needs to determine the direction that his buildings would face—as well as the size of rooms and windows—using calculations of sun position and lighting as well as ventilation. Specifically, Meyer designed the ADGB Trade Union School considering these biological aspects:

The facade of the living space is not turned to the sun through coincidence and peradventure; rather the dwelling's orientation is calculated according to a biological methodology that strives to achieve the greatest possible solar illumination for all living quarters in this northern German clime. No bed without sun!
(Meyer, undated)

To understand more accurately Meyer's intentional use of biology in architecture, consider also the influence from Konrad von Meyenburg (1870-1952), who was a business owner and inventor of agricultural machinery. Meyer's biological concept was influenced by Meyenburg's work in the 1920s (Winkler, 1989), primarily an essay titled "Culture of Planter, Human beings" in *Bauhaus* magazine (Meyenburg, 1927). Meyer then invited Meyenburg to be a special lecturer at the Bauhaus in 1929, one year after Meyer wrote a text titled *Building* (1928; the original used *building* [lowercase] throughout the text), using the term "biological" as follows:

building is a biological process. building is not an aesthetic process. in its basic design the new dwelling house becomes not only a piece of machinery for living in but also a biological apparatus serving the needs of body and mind.
(Meyer, 1928)

Thus, Meyer is noted the psychological and ergonomic aspects of human biology; at first, this biology concerned physical aspects, such as sunlight allocation and ergonomics in architectural design. This kind of biological consideration was quite common in architecture at the end of the 1920s and was used in the design of Meyer's ADGB school primarily through calculations of sun positions and sunlit areas. Biology concerned with psychological aspects, however, was only considered in a broad sense, though it can be interpreted that Meyer's biology has two meanings: biology in a narrow/physical sense and in a broad/psychological sense. The latter was characteristic of Meyer during this period, using the words "psychology" and "biology" for a piece in *Bauhaus Dessau*.

It was our hope to give added depth and richness to architecture by an analysis of the social situation and a careful study of all biological factors, special attention being paid

to the psychological factors involved in the way people organized their lives.
(Meyer, 1940)

In *Bauhaus Dessau* there are two overarching themes: social situations and biological factors. As such, psychological factors were subordinate yet notable points contained within these two concepts; therefore, it is understood that biology was a major premise of Meyer's architecture and that psychology was especially valued among the subordinate concepts.

Bauhaus Students

Biological analyses were also a key feature in Meyer's architectural education at Bauhaus, writing the following in *Bauhaus and Society* (1929b): "Its [new architectural theory of Bauhaus] creative media deliberately employed the results of biological research."

To reflect Meyer's architectural education, Bauhaus students also used biology to determine the direction that buildings would face as well as the size of rooms and windows, in addition to considering sun positions and ventilation. Hans Wittwer (1894-1952), a business partner of Meyer from 1926-1929, taught calculations of sun positions and ventilation in his architectural theory course for two years from its establishment in 1927 (Winkler, 2003). In fact, Meyer and Wittwer's drawings of the ADGB school competition project (1928) used calculations on the position of the sun and sunlit areas in exactly the same way as Bauhaus students had done in their drawings. Similarly, Tolziner and Weiner's communal housing for the factory workers in 1930 was based on the method taught in Wittwer's class (e.g., calculating the sun's position on summer and winter solstice days as well as spring and autumn equinox days in Saumur, France) (Tomita, 2016). Tolziner (1989) mentions, "We used the same planning technique that we learned in the architectural theory course and applied it in the architectural studio course, but we attempted a new solution method in the plans."

Meyer's Scientific Worldview

Meyer's Scientific Worldview and the Unity of Science

As mentioned, Meyer designed the ADGB Trade Union School on the basis of sociological, psychological, and biological analyses. Since Meyer's individual scientific approach unified these themes into architecture, this is considered to be a unification theory among these disciplines. Meyer defined architecture as an aggregation of sciences, and architects as specialists that are tasked with organizing the sciences:

building is only organization: social, technical, economic, psychological organization [...] the new house is a prefabricated unit for site assembly and, as such, an industrial product and a work of specialists: economists, statisticians, hygienists, climatologists, industrial engineers, standards experts, heat engineers ... and the architect? ... he was an artist and has become a specialist in organization!

(Meyer, 1928a)

To understand the background of Meyer's intentional definition of architecture as organization, the reference to "Logical Foundations of the Unity of Science" (1938) written by Rudolf Car-

nap, a member of the Vienna Circle, should be considered. The “unity of science” movement by the Vienna Circle and the Bauhaus mutually affected one another (Galison, 1990); for example, in 1929, the special lectures by members Otto Neurath, Herbert Feigl, and Rudolf Carnap were held at the Bauhaus; Meyer gave a lecture at Wien at the invitation of the Vienna Circle members in 1929; and Carnap, in his “The Main Branches of Science” within “Logical Foundations of the Unity of Science,” ordered the organization of sciences as shown in Figure 3 (top).

Initially, Carnap (1938) distinguished formal science and empirical science: “Formal science consists of the analytic statements established by logic and mathematics; empirical science consists of the synthetic statements established in the different fields of factual knowledge.” Later, however, he divided empirical science into “physics” (a common name for the nonbiological field of science) and “biology,” where physics included chemistry, mineralogy, astronomy, geology (i.e., historical), and meteorology, biology included physical biology as well as psychology and social science. Carnap stated the following about psychology and social science:

[They deal] with the behavior of individual organisms and groups of organisms within their environment, with the dispositions to such behavior, and with certain features of the environment which are characteristic of and relevant to the behavior, e.g., objects observed and work done by organisms.

(Carnap, 1938)

These concepts are similar to Meyer’s sociological and psychological characteristics used in his architectural design mentioned in previous sections of this study; therefore, we reconstructed Meyer’s scientific worldview based on the framework of sciences in “Logical Foundations of the Unity of Science” (Figure 3, bottom). This reconstructed organization of Meyer’s scientific worldview is also evident when comparing the two versions of his paper, “The New World” (*Die neue Welt*), which was issued first in 1926 and then again in 1928 (Poerschke, 2014). Important differences between these two publications are shown by the underlined text in the below passages:

Building is a technical process. Building is not an aesthetic process. The utilitarian functions of houses sometimes contradict aesthetic constructions. In its basic and essential design the house becomes a piece of machinery for living in... Thinking of building in functional terms in all aspects leads logically to pure construction.

(Meyer, 1926)

building is a biological process. building is not an aesthetic process. In its basic design the new dwelling house becomes not only a piece of machinery for living in but also a biological apparatus serving the needs of body and mind ... thinking of building in functional and biological terms as giving shape to the living process leads logically to pure construction.

(Meyer, 1928; original text uses the lowercase)

The emphasis on technical functionalism in the 1926 version of Meyer’s paper is transformed to the word “biological” in the 1928 version, a factor that was added to functionalism—in Meyer’s view—at that time. The 1928 version indicates that Meyer noted psychological and ergonomic aspects and provided a reconstructed organization of his original scientific worldview. Thus,

Meyer shared theoretical structure with the unity of science movement at a conceptual level.

Meyer's Scientific Worldview and Bauhaus Students

According to Neurath, Meyer also instructed his students to refer to the general concepts of the “scientific conception of the world,” not only to biology and sociology. Neurath, who was also socialist activist, criticized Meyer’s architectural works, theory and teachings at Bauhaus in the magazine *Der Klassenkampf* (*The Class Struggle*) in collaboration with architect Josef Frank as follows:

From the seriousness of such belief, he [Meyer] attempt biological and sociological underpinning of architecture. Again and again he referred his students to science, not only technical, biological, and sociological discipline, but also modern scientific conception of the world in general.

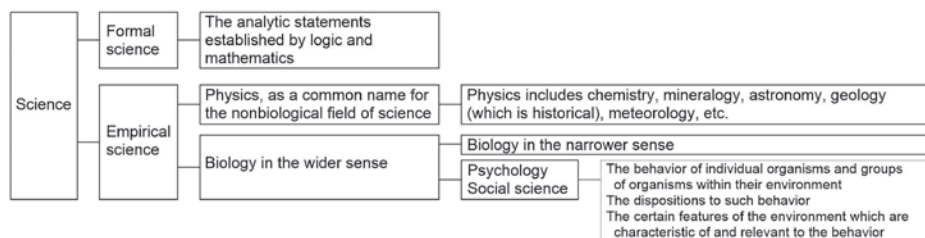
(Frank and Neurath, 1930)

Since “scientific conception of the world” is also used as the title of a book by members of the Vienna Circle, it can be inferred that Nuerath’s words are alluding to the unity of science movement itself.

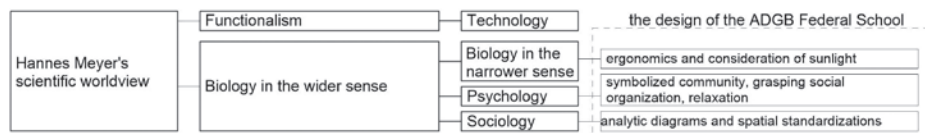
Tolziner and Weiner’s communal housing for factory workers clearly reflected this sentiment by Meyer, with Tolziner (1989) describing their calculations and design regarding a floor plan as follows:

“...there was an attempt at an expression to facilely and visually take in all structural elements of the ‘Calculation and Design Leading to the Resolution of Floor Plans for Integrated Dwelling Units,’ so that people could follow the process to achieve and prove the solutions to the problem.”

Thus, they reached an important and original solution that unified the individual scientific



The organization of sciences in Rudolf Carnap "Logical Foundations of the Unity of Science" (1938) (by Author)



The reconstruction of Hannes Meyer's scientific worldview (by Author)

Fig.3 The reconstruction of Hannes Meyer’s scientific worldview based on the framework of organization of sciences in Rudolf Carnap’s “Logical Foundations of the Unity of Science” (1938)

analyses into architecture, using basic scientific principles taught during their architectural education at Bauhaus under Meyer.

Conclusion

This study reveals the following points. First, that Meyer used sociology to design analytic architectural diagrams and spatial standardizations. Second, he (and his students) used psychology to design spaces that enabled people to recognize a symbolized community, to grasp a social organization, and to help them relax their mind. Third, Meyer used human biology to determine the size and orientation of buildings, rooms, and windows, unifying the sciences of biology, psychology, and sociology in not only his works but also his architectural instruction. Finally, this unified scientific worldview was similar the framework noted in “Logical Foundations of the Unity of Science” and, on a conceptual level, shared a common theoretical structure with the unity of science movement itself. Meyer’s scientific worldview was reflected in his theory of architectural education at the Bauhaus as well as in his students’ works, as he incorporated key concepts from biology, psychology, and sociology, and invited specialists from a wide variety of fields to serve as guest lecturers. The Bauhaus under Meyer was committed to a scientific worldview.

Following the 1920s and Meyer’s work to pioneer a new structure for architectural education, he and seven graduates (including Tolziner and Weiner) went to the USSR to build city structures for the socialist state in 1930; another graduate went to Palestine to work on architecture for the Jewish state in 1931. Many of Meyer’s students went on to be concerned with city planning and architecture design around the globe. Meyer’s architectural education courses at the Bauhaus were unique in their approach as well as for their time and place, and both Meyer and his students manifested these scientific concepts and analytic methodologies in their global activities following their time at the Bauhaus.

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Author Biography

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Building on his research into Walter Gropius and Hannes Meyer, Hideo Tomita (b. 1974) received his Doctor of Engineering degree in March 2002 from Hiroshima University. From 2005 to 2006, he was a guest researcher in the Faculty of Architecture at Bauhaus University Weimar. In 2015, he won the JAABE Best Paper Award 2014 from the Architectural Institute of Japan, Architectural Institute of Korea, and Architectural Society of China for his essay on Meyer's activity in Moscow. From 2016 to 2017, he was a guest researcher at the Institute of Architecture, Technical Institute of Berlin.

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