

## Original Contributions - Originalbeiträge

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# Science of perception for design: the view of Walter Gropius

## 1. Introduction

Walter Gropius has always been considered one of the most relevant figures in the field of the twentieth-century design. A huge amount of papers deal with manifold aspects of his conceptual perspective (for example, see Argan, 1951; Probst & Schädlich, 1985; 1986; 1987; Lupfer & Sigel, 2004; MacCarthy, 2020). The current paper focuses on the theories that underlie Gropius' science of perception, drawing particularly from the 1974 article entitled *Is There a Science of Design?* The present essay aim is to outline the relationship between Gropius and the psychological theories. This relationship had also a remarkable impact not only on the Bauhaus pedagogy (Sinico, 2021) but also on the scientific approach to design.

In *Is There a Science of Design?* Gropius introduces the topic with a very indicative statement, in which he declares that he has gained deep knowledge of the psychology of perception.

«For many years I have systematically collected facts about the phenomenon of our human sight and its relation to the other senses, and about our psychological experiences with form, space and color» (1962, p. 30).

In this passage, he also admits the epistemological legitimacy of a “psychological” perceptual experience, which is implicitly a cognitive level that lies on this side of the transphenomenal world of the natural sciences. The legitimacy is underlined, in italics, also in the same paragraph:

*«I consider the psychological problems, in fact, as basic and primary, whereas the technical components of design are our intellectual auxiliaries to realize the intangible through the tangible»* (1962, p. 30).

The distinction between psychology and technique must immediately be emphasized because it implicitly refers to spiritual psychology (in coherence with idealist irrationalism), dualistically opposed to experimental phenomenological psychology that finds in the contents of immediate experience a basis of autonomy from the subject and, consequently, a term of scientific objectivity. This contrast, as will become clearer in a little while, has generated crucial theoretical friction in Gropius.

Once the importance of the psychological dimension has been established, Gropius also stresses the need to reach scientific knowledge, as an attitude towards objective research:

«If we can establish a common basis for the understanding of design - a denominator reached through objective findings rather than through personal interpretation - it should apply to any type of design; for the process of designing a great building or a simple chair differs only in degree, not in principle» (1962, p. 30).

Gropius explicitly states the need for “understanding design” based on “objective research”, seeking a “common basis”, avoiding relying on “personal interpretation”. With all this, he distances himself from the risky preconception of the subjectivity of perception, which is necessarily self-contradicting for each subject-designer who designs for another subject-user. In fact, to the extent that a radical subjectivity of perceptual experience is assumed, as a relativism of code, the even theoretical possibility of “designing for” is denied. This, however, doesn’t deny in principle the subjectivity of perceptual experience, since one must also distinguish a subjective experience exclusive to the private sphere, internal to the ego, from a subjective experience that refers to a public, external datum of the ego, based on which to establish an intersubjective verification, to which the objectivity of the design result can be obtained.

However, this apparent distancing from subjectivism, which would be justified by the need for objective knowledge, would seem to be disproved by the subsequent argument that implicitly clarifies the assumptions of Gropius’s theory of perception:

*«Most important is the fact that sensation comes from us, not from the object which we see»* (1962, p. 2).

If we stick to the meaning of tradition, from Thomas Reid to today, the term ‘sensation’ refers to the response of the sensory organ and is distinguished from ‘perception’ which denotes the conscious content of what one experiences. The physiological system belongs to the perceiving subject and not, obviously, to the distal stimulus that activates the senses. It is, therefore, truistic that the sensation comes from ourselves and not from the object under observation. Although the terms ‘sensation’ and ‘perception’ are used ambiguously in the text, Gropius emphasizes this truism to emphasize that perception does not coincide with the distal physical datum. Gropius’s thesis is that the distal physical datum undergoes a transformation through the sensoriality or in any case through the mental system. This thesis is exemplified by a demonstration borrowed from the pedagogist Earl C. Kelley, reported in his major work: *Education for What is Real* (1947).

## 2. The (questionable) theoretical reference of Gropius

Before moving on to discuss the demonstration, it is important to note that Kelley, a scholar registered in the limited field of Experiential Education (see Raiola, 2011), is not mentioned even in the most comprehensive works of psychology (see for example Boring, 1950). It is therefore probable that Gropius did not seek an authoritative reference in the science of perception, which incidentally dealt with pedagogy; but, conversely, it would seem that he chose a reference in pedagogy that incidentally dealt with perception. Secondly, it can be hypothesized that Gropius's choice was motivated by the need to find a reference for some of his assumptions rather than to test his theses by confronting the most recognized theorists of perception of the time.

At a closer look, Kelley had a particular theoretical-psychological background. According to Kelley, perception, based on past experience and the purpose of the observer (Kelley, 1957), was a useful term to underline the uniqueness of the experience for each individual, and consequently the need to personalize the educational program (Wyett, 1969). As a high school teacher, Kelley came into contact with Adelbert Ames Jr., a proponent of Transationalism, from whom Kelley absorbed a theoretical perspective that could be framed in the so-called New look on perception. This paradigm developed in the United States after World War II, met a certain fervor, although it then declined rapidly. The New Look claimed that human psychology must be conceived in its entirety. This postulate could not fail to resonate in conformity with the educational conception, albeit of greater breadth, of Gropius (1935):

«(...) the principle of training the individual's natural capacities to grasp life as a whole, a single cosmic entity, should form the basis of instruction throughout the school (...)» (1935, p. 52).

The New look went so far as to hypothesize the influence of factors related to personality, needs, and motivations, on perception. This paradigm had carried out even more experiments in which it was believed to have demonstrated that the same coins were perceived larger by poor children than by rich children (Bruner & Goodman, 1947). The most rigorous critical discussion dismantled the theory by revealing all the methodological inconsistencies (see Kanizsa, 1961; and on the impenetrability of the perceptual module, the fundamental essay by Pylyshyn, 1999). The idea of being able to modify the empirical reality is however so gratifying and exhilarating that even today, among those who do not have the scruple to take into reasonable consideration the most qualified scientific discussion, adepts of this theory can be found (for a discussion on these temptations, see also Firestone & Scholl, 2016).

It is important here to analyze how Kelley's demonstration would prove that "we receive sensations not from things around us but from ourselves". Kelley invites the reader to look inside each hole of three screens (see Figure 1, which shows the original figure), behind which there are three different objects: a cube of wires; a drawing of a cube on a frontal plane; wires with strings suitably placed in space.

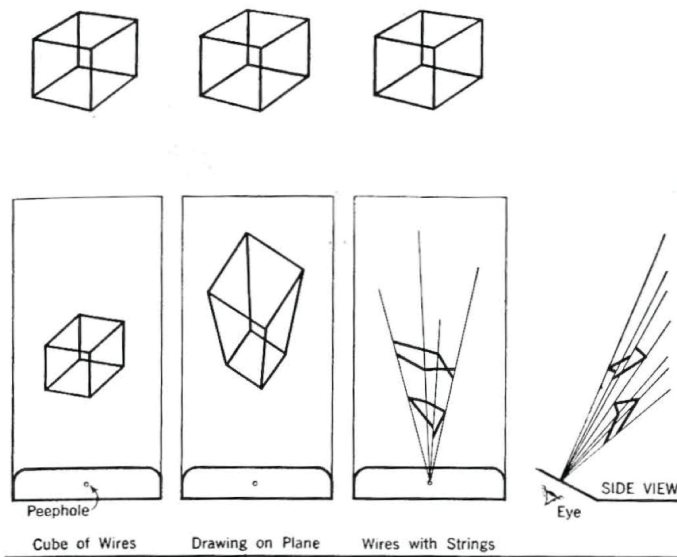


Fig. 1. The Kelley's demonstration.

In all three cases, a cube is seen from the hole, and therefore Kelley concludes that:

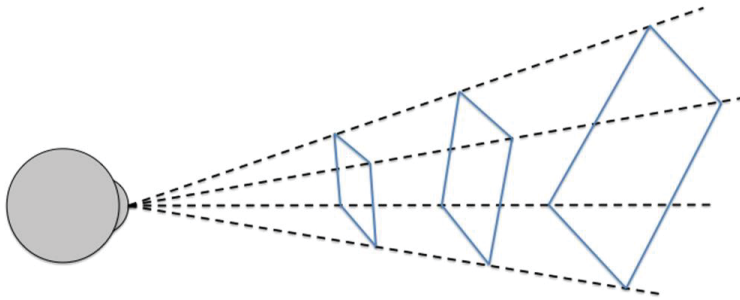
«Widely different materials caused the same pattern on the retina of our eye and resulted in the same sensation. The sensation could not come from the material, since in two cases it was not a cube. It could not come from the pattern on the retina since that pattern was not a cube. The cube does not exist except as we call it a cube; and that sensation did not come from the material in our environment, but from us» (1962, p. 31).

Kelley uses the reduction screen expedient. The reduction screen allows you to isolate the visual field. So much so that, in Kelley's example, the three objects on the reduction screen all appear as three cubes, precisely because they are perceived insulated from the three-dimensionally context: the retinal images of the observer, in all cases, are not due to the cubic objects that they are behind the screen but are due to the images present on the reduction screen, which are identical in the

three cases: a cube that is articulated three-dimensionally in the pictorial space. As the consequence, the observer cannot see that the perceived cubes are different objects because, due to the reduction screen expedient itself, he can only see three identical images. To Kelley's statement "that sensation did not come from the material in our environment, but from us. It came from prior experience" (1962, p. 31) it can therefore be replied that the sensation could not come from the object, since it was no longer under observation.

Instead of using the reduction screen, Kelley could more trivially make use of the evidence that the distal object (in the demonstration, the three three-dimensional cubes) is always reduced, in the retinal projection, to two dimensions, because the retina is a two-dimensional surface, as he could also have recourse to numerous other facts: that the retinal image is inverted due to the effect of the lens; which is curved, because the retinal surface is concave; which is double, because the eyes are two; etc. Despite these facts, which attest to the adaptation of the stimulation to the morphological characteristics of the retina, the observer always perceives a three-dimensional cube. From this simpler premise, Kelley could have deduced that the three-dimensionality of the cubes is not perceived directly by the distal stimulus because the retinal mediation, the physiological stage from which sensations are formed, transforms visual information into two dimensions. In short, it was enough to take as a reference the phenomenon of perceptual constancy or the so-called "experience error" by Köhler (1929-1947).

In the 1940s, numerous volumes of experimental psychology discussed the subject of perceptual constants. One of these, very authoritative, is Wolfgang Köhler's *Gestalt Psychology*. The first edition of which came out in 1929, the second in 1947. This essay is here significant because in 1929 Köhler himself was invited by Hannes Meyer (who took over from Gropius, in March of the same year, as director of the Bauhaus) to give a lecture at the Bauhaus (Wingler, 1962). The relevance of this link between Gestalt psychology and the Bauhaus will be reflected in the conclusions. Now it is necessary to deal with the evidence that the perceived data does not coincide with the retinal image. This evidence is given by the so-called perceptual constancy, regardless of any explanation of the phenomenon itself. Consider the example of the constancy of form: if we look at a rectangular frame, lying in front of us on the frontal plane, the retinal projection is (with some approximation) a rectangle, and the perception is of a rectangular shaped frame. However, if we tilt the frame deeply, the retinal projection will be (with a certain approximation) a trapezoid, and yet we will continue to perceive a volume of rectangular shape, inclined in space (see Figure. 2). In other words, perception does not coincide with the proximal stimulation of the retina, it does not coincide with sensation.



**Fig. 2.** The perception of an object's shape remains constant even when the object has different orientations.

In addition, in the late 1920s, Köhler also introduced the notion of “experience error”. Köhler clarifies that attributing to the retinal image what belongs to the phenomenal experience is a mistake. In fact, on the retina, properly speaking, there is no image. On the retina, there are only single and isolated more or less activated receptors. The image is an entity, with a different degree of complexity, which cannot be reduced to the individual elements of the retinal mosaic. So Kelley’s statement, that the cube “It could not come from the pattern on the retina since that pattern was not a cube”, is true in all cases where there is retinal stimulation.

The physiological retinal stage is, however, like all the other stages of the psychophysical scheme assumed by Kelley (from distal stimulation to optical mediation, to the retina, to the lateral geniculate nucleus, to the cortex, to the percept) always a sufficient but not necessary condition for the perceptual outcome (Bozzi, 1989). But Kelley, with the unnecessary stages of the psychophysical scheme to have the perception of a fact, excludes the ontological fact: he affirms that the cube “does not exist”, entering into contradiction. If Kelley states that the three-dimensional distal cube cannot be seen because the observer has only the two-dimensional vision from the retinal projection (or in any case from the reduction screen) then he cannot assume that the distal cube is three-dimensional because, to affirm it, it is necessary to see it, and since he argues that one cannot see it, the proof fails.

Nevertheless, on the strength of his proof, Kelley concludes the reasoning thus: “(...) that sensation did not come from the material in our environment, but from us. It came from prior experience” (1962, p. 31). Unfortunately, even the hypothesis that past experience can determine the perceptual data (which Kelley here calls ‘sensation’) is a notoriously questionable theoretical option insofar as it is not possible to justify a first experience. Less than it is logically derivable from the demonstration itself, if not as a false cause.

Kelley's entire argument, with all its epistemological weaknesses, is assumed by Gropius, who reports, at the end of the paragraph, referring to the perception of a child, his stadial theory of perception:

*«what is at first a mere reflected image on the retina assumes, in later life, symbolic meaning by experience»* (1962, p. 31).

The postulate, reaffirmed later in the text by Gropius, that the visual perception of depth is structured based on tactile experience, derives from the theory of Georg Berkeley and has an important development in Piaget (1937). From the 60s, however, thanks in particular to the research of Gibson (1960), this postulate has been shown inconsistent. The Ecological approach exhibits solid experimental evidence in favor of a perceptual system already structured in newborn children (Gibson, 1991). Leaving aside the age-old historical discussion on innatism versus empiricism, more simply, the results of the most recent experimental research do not allow today to affirm that the meanings of visual perception are necessarily due to an ontogenetic evolution tout court.

However, Gropius did not have this literature available. According to Gropius, who wrote two decades earlier, the perceiving subject “sees” in the first instance the retinal image and, in a subsequent evolutionary stage, enriches the mere sensory datum with the addition of symbolic meanings. The addition is necessarily a contribution of experience in terms of “Erfahrung”, that is, of cognitive integrations that obviously have a cultural, conventional significance. The subsequent enrichment would therefore be the contribution of subjective intellectual knowledge as opposed to the sensorial one.

Further on, the German architect presents the second axis of his theory of perception, a topic in which the unconscious is polarized (subconscious reactions, it must be said, however, that his examples deal mostly with reflex reactions) and intellectual knowledge). Unlike the latter, the unconscious gives a determined response and is impenetrable by critical evaluation.

### **3. Gropius' (instinctive) phenomenological approach**

In the following sub-chapter, entitled *Design education*, Gropius identifies a theoretical space for two dimensions reality-illusion and conscious-unconscious which represents the place of the creative source. He does not deal with the creative dynamic but presents some reflections on the practical need of the educator. In these passages, his refined practical-artistic disposition towards empiricism emerges. There is, in the paper, a real phenomenological turning point:

*«The subconscious or intuitive powers of an individual are uniquely his therefore. It is futile for an educator in design to project his own subjective sensations into the student's mind. All he can do successfully is to develop*

his teaching on the basis of realities, of objective facts common to all of us» (1962, p. 32).

Resuming the opening assumptions, Gropius insists on the need to exclude the inscrutable sphere of subjectivity from the educational perspective and to turn instead to the public datum, to that perceptual experience external to private experience which is a common and shared basis with the other observers, and on which the objectivity of the observable world is established intersubjectively. And he continues:

«But the study of what is reality, what is illusion, requires a fresh mind, unaffected by the accumulated debris of intellectual knowledge. Thomas Aquinas has said, “I Oluست empty my soul that God may enter”. Such unprejudiced emptiness is the state of mind for creative conception (1962, pp. 32-33).

The inspiring quote from Thomas Aquinas is a phenomenological program (Sinico, 2021). The void, into which God should enter - God who stands here for the creative leap - is an erudite enunciation of the Husserlian epoché. One would therefore notice a downsizing of the contribution of that intellectual knowledge, as opposed to the sensorial one, obtained, as mentioned above, in ontogenetic evolution. The next passage confirms that Gropius is referring precisely to observation, cleansed of the prejudices of acquired knowledge to return to “things themselves”, to use Husserl’s words,

«The initial task of a design teacher should be to free the student from his intellectual frustration (...). He then must guide him in the process of eradication of tenacious prejudices and relapses into imitative action by helping him to find a common denominator of expression developed from his own observation and experience» (1962, p. 33).

The student freed from any “intellectual frustration”, that is by neutralizing the intellectual knowledge acquired, must find a “common denominator of expression developed from his own observation and experience”, that is, he must grasp reality in its own giving. That “his own”, referring to the student, could lead one to believe that Gropius is unable to free himself from the subjective dimension. But the next step also eliminates this suspicion:

«If design is to be a specific language of the expression of subconscious sensations, then It must have Its own elementary codes of scale, form and color» (1962, p. 33).

If the design is defined as a specific communication language, it must necessarily be based on a common basis that makes it possible to share the message between whoever emits the message (the designer) and whoever receives it (the receiver). This common basis, expressed through perceptual messages, which “link man



even closer than do words” (1962, p. 33), consists of norms, and two, a plan of universal laws is finally required:

«The designer must learn to see; he must know the effect of optical illusions, the psychological influence of shapes, colors and textures, the effects of contrast, direction, tension and repose» (1962, p. 33).

All these examples concern intersubjective perceptual effects or laws. Starting from the so-called “optical-geometric” illusions, which despite being by definition an antinomy between the physical-measurative description and the description given in immediate experience, remain, in their illusory effect, completely stable and intersubjective, until reaching the effects of shadow, of the phenomenological laws on color perception, of texture, of contrast, etc., Gropius attests to an *iuxta propria principia* perceptual level and completely detaches himself from the New look theory, having to accept, as a designer, that in the empirical world there are not only vague hints for philosophical speculations but also stable perceptual constraints and disrespectful of the observer’s will, beliefs, and desires.

Two other significant theoretical links influenced Gropius’ phenomenological approach (see Argan 1951). The first is Konrad Fiedler’s “pure visibility”, and the second is the De Stijl movement. Argan, concerning Piet Mondrian, argues even that:

«That experimentation on the relationships between perception, space and form represented an important contribution to the Gestaltstheorie that Gropius was developing as the very theory of architecture» (1951, p. 78).

Despite all these significant correspondences, unlike Gestalt psychology, for Gropius, the ontological option is part of the phenomenal definition, and experience (*Erlebnis*) is part of the internal sphere of the subject: it is a kind of psychology “with the soul”, “Keine Gestalt ohne Gestalter” (1930, p. 17), as William Stern said. Therefore it is a psychologism that admits intersubjective convergence only because of the similarity of mental systems between individuals. Here lies the difference with Gestalt psychology. Difference due to numerous derivations, perhaps also from the Machian influence reinforced by the close relationship with László Moholy-Nagy, certainly by contacts with Felix Krueger’s Leipzig School.

But Gropius’ notable insights are also those of an architect who uses observables for concrete purposes and of the theorist who speculates on paradigms. In this capacity, Gropius addresses the expressive qualities, the illusory effects in architecture, the ecological organism-environment relationship, etc. First of all, he needs to define the effects of expressiveness in a non-smoky way:

«Vague phrases like “the atmosphere of a building” or “the coziness of a room” should be defined precisely in specific terms» (1962, p. 33).

Gropius presents the theme of expressive qualities, the fact that colors can be “warm or cold”, shapes “light or heavy”, etc. He reports a dense list of effects from the pages of an article by a “New York designer”. In the cited article, the perception of expressive qualities is confused with the effects of expressive qualities on the perceiving subject. Gropius could have found a scientific basis both in the Berlin Gestalt theory of Köhler (1947) and in the Lipsian theory of Klages (1921). Even far from the more systematic and experimentally subsequent theoretical development (see Sinico, 2015), the two references already represented in the thirties a solid conceptual tool for managing the fascinating theme of expressive qualities in scientific terms.

Equally remarkable are Gropius’s observations on composition and the human scale, that is, “the unit of measurement when we perceive our external environment” (2007, p. 57). A definition that has a very relevant meaning concerning the experimental psychology of the twentieth century. In the sixties, the redefinition of the perceptual environment gave rise to the ecological revolution of James J. Gibson (1979). The American psychologist has split the cognitive paradigm in two, differentiating himself from the Modularity of mind, and has renewed the science of vision by introducing a systemic perspective in which the external world is no longer defined in physical terms but with an ecological metric. We are therefore right at the intuitions of Gropius.

Gropius and finally an answer to the (rhetorical) question of the title: Is There a Science of Design?

*«The intuitive directness, the short cut of the brilliant mind, is ever needed to create profound art. But an optical key would provide the impersonal basis as a prerequisite for general understanding and would serve as the controlling agent within the creative act» (1962, p. 43).*

The answer is affirmative if an intersubjective basis is ensured that not only allows understanding but also - and here we are at the most extreme scientific concreteness - a control, which is a call to an experimental method.

#### 4. Conclusion

What conclusions can be drawn? Firstly, Gropius, who sets a science of design as his goal, oscillates between a theory that postulates the subjective contribution in perception and the need to find a common intersubjective basis independent of the subject (this must be the empirical datum to constitute a bench of control test). The theoretical support of the first position, Kelley’s demonstration, proves to be technically inconsistent but similar to the psychologist idea derived from the Ganzheitspsychologie of Krüger and his pupil, Count Karlfried Graf Dürckheim who has been lecturing at the Bauhaus since the time of Gropius. For

these psychologists from Leipzig, understanding the perceptual structure requires not stopping at the form encountered in the phenomenal experience but going back to the perceiver's "feelings" (Gefuehle). A theory, that of Krüger, with vague outlines, never epistemologically justified, which the history of the scientific psychologist has condemned to oblivion.

The questionable choice of the theoretical reference in the didactic field, namely Kelley, seems to be due to the lack of familiarity with scientific-epistemological reflection. This choice does not accord with his phenomenological instinct. The phenomenological approach is in fact an approach oriented towards concrete facts, much more functional to the needs of a concrete design discipline. Gropius could have made more use of this phenomenological instinct by referring to the psychological and pedagogical theories of the time, in particular to Gestalt psychology.

Gestalt theory was instead an alternative theory, which would have given substance to the theoretical objective of design science. In 1947 there were already some of the main volumes of the Berlin School in circulation and, above all, Max Wertheimer's Gestalt psychology enjoyed wide fame, respect, if not even deference, and was copiously used in Gyorgy Kepes' *Language of Vision* (1944), a book that Gropius cites among the essential bibliography in the last paragraph of the article. The fact that Gropius relied, precisely for the theme of perception, on the pedagogy of Kelley and the theory of the psychologists of Leipzig, and did not instead feel the need to verify a more authoritative conceptual proposal of the psychology of perception, leads to note incidentally a final historical link.

According to certain suppositions (Wingler, 1962) Köhler's best pupil, Karl Duncker, gave a lecture at the Bauhaus in 1929. If that's not true, because it's not supported by any document. In any case, the then director of the Dessau School, Hannes Meyer, had certainly invited Köhler himself. Mayer then turned to the highest European authorities in the field of perception science. Gropius, in an exchange of letters with Tomás Maldonado (1963), after having claimed responsibility for the organization of the lessons of Count Dürckheim (as well as Wilhelm Ostwald) writes:

«The principle of these methods [scientific methods, ed] was already established before Mayer dealt with the Bauhaus, but he specified them better» (1974, pp. 169-170).

Without wishing to delve into the complicated personal relationships between scholars that characterized the lively and tormenting season of the Bauhaus (Wingler, 1962), one could find, in Gropius, a certain caution in referring to Mayer's contribution. It would seem, as regards at least the psychology of perception, that Mayer's contribution was not only quantitative, but that, opening the

School, among others, to Gestalt psychology, to some members of the cenacle of Reichenbach and the circle of Vienna, tried to achieve a real qualitative leap of methodological change. This contribution has settled in the culture of design and is today, in the interconnected scientific system, a decisive cultural heritage for the most coherent disciplinary evolution.

## Abstract

This paper discusses the theories underlying Walter Gropius' conception of science. Starting with "Is There a Science of Design?" written by Gropius in 1947, the influences of Ganzheitspsychologie and the New Look on Perception are traced. In particular, the contribution of Earl C. Kelley is analyzed. Subsequently, Gropius' phenomenological approach, insights on expressive qualities, and the relationship between man-environment are discussed. Finally, the influences of Gestalt theory and spiritualistic psychology on Gropius's conception of science and perception are outlined.

**Keywords:** Walter Gropius, Bauhaus, Phenomenology, Gestalt Psychology, Visual Perception.

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