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# The Aesthetic Message of Holography

## ABSTRACT

The importance and value of holography as an art medium can be poorly substantiated by a superficial comparison with diversified aesthetic expressions from the past; this often has been done. However, any truly useful analysis of the unique aesthetic message of holography first has to deal with the medium itself and the investigation of its inherent autonomous structure. Holography really should be understood as a specific aesthetic expression of our times that opens us to a new perception of our philosophy of life. The author demonstrates some parameters of the autonomous structure of holography. The aesthetic message of the medium discussed in that way is distinguished by an immediate paradox: the holographic image appears to be a normal picture, but simultaneously the illusion of the image that normally would be expected is completely destroyed. Consequently, the traditional difference between image and reality in general is overcome and cancelled. Thus holography makes a radical break with geometric, perspective optics. At the same time, the predominant paradigm of objectivity as an illusion of reality is revealed.

Peter Zec

**G**isèle Freund states that every historical epoch has its own artistic modes of expression that reflect the political character, thoughts and tastes of the times [1]. At another point she writes that each society creates its own particular modes of expression largely through its life-style and tradition and that these modes in turn reflect the epoch. Every change in society influences the theme and type of artistic representation [2]. If one agrees with Freund's point of view, it becomes necessary to look at holography from a perspective different from those used up to now. We have to ask in which way and using what aesthetic methods and means does holography correspond with the thoughts and tastes of our times or, to put it differently, whether the aesthetic message of the medium is able to influence as well as express the characteristics and trends of the present experience. Above all, it is essential to examine what holography is and how this medium articulates its aesthetic message.

This is not intended to be another detailed explanation of the technical principles of the recording and reconstruction of a hologram, which has already been done innumerable times [3]. Of more importance here is the intention to investigate the aesthetic side of the medium.

As with other technical media, such as photography or film, up until now the recognition and acceptance of holography as an artistic mode of expression has been highly controversial. Advocates of this new medium, for whatever reasons, recognize holography as a completely new art form and propagate the special qualities of holography as unique and revolutionary. This is precisely what prompts many critics to regard holography either as kitsch or simply as technical game-playing and thus as something to be rejected. Amidst this controversy, more and more artists are attempting to establish respect for holography and for themselves within the traditional art world. At the same time, numerous business people are equally interested in commercializing the attractive, spectacular aspects of holography. The activities here range from the organization of popular exhibitions to the production and commercialization of holographic stickers, badges and fashionable accessories.

At first glance, these very different uses of holography call for a clear definition of the medium in order to be able to distinguish between high-quality art holograms on the one hand and the trivial form often categorized as kitsch on the other. If we take a closer look at these aesthetic judgments, we quickly find that they usually are based simply on intuitive and subjective taste. This is also valid in those cases where the attempt is made to differentiate using arguments intrinsic to art.

Whoever attempts to condone or condemn the artistic

importance of the medium, as opposed to so-called *holo-kitsch*, ignores the fact that art-intrinsic evaluation has become impossible today at a time when there is no absolute aesthetic, neither in the form of a validly defined, meaningful art theory nor as a homogenous sense of experience and perception. If judgment is made nevertheless, it can only be arbitrary and nonobligatory and its validity based, without exception, on rhetoric. For today, at a time characterized sometimes as postindustrial or as postmodern, the same principle is valid for the evaluation and interpretation of contemporary expression, as is valid in most other areas of life, i.e. anything goes.

But from the moment when anything goes, there must also be a concomitant drastic change of the meaning of common values and norms. This change of meaning signifies, among other things, a lack of obligation and the negation of the validity of formerly concrete, definable statements. In accordance with this development, there is also a change in the meaning of history and art history. If we neglect these changes of meanings in our present times and attempt to establish the artistic importance of holography by considering the medium within the context of modern art, we should not be surprised when the exact opposite can be demonstrated in the same manner. In this case, the exact opposite means that it is also possible to show the unimportance of holography by using some examples from art history. For example, those who try to establish the artistic importance of holography by looking at the medium within the context of the art avant-garde of the first half of the twentieth century, such as Futurism, Constructivism, Cubism or the Bauhaus style, need to be reminded that the artists of the 1960s and 1970s who formed the avant-garde of their period did not make use of holography—with some exceptions, such as Ruben Nuñez or Carl Fredrik Reuterswärd. Superficially it seems that holography at that time

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could at least have been a useful resource for kinetic and op art. Nevertheless, the holographic medium was completely ignored at that time by representatives of these art forms, although they had the opportunity to use the new medium. Unlike the kinetic and op artists, the often-quoted early avant-garde artists of the twentieth century never had the opportunity to make use of this medium.

As this example proves, the importance of holography can be poorly substantiated from a historical perspective. If we intend to deal with the subject seriously in order to comprehend what is 'new' about the aesthetic message of the medium, this can never be done with a superficial comparison of diversified aesthetic expressions from the past. This method of orientation would only consider the new within a framework no longer valid, instead of exploring it in its own present reality.

As much as artists, critics and advocates of holography attempt to connect the medium with the historical past in different ways, they are not able to change the fact that holography is a characteristic medium of our times and that it gains its sense and importance only from the present. Wherever we attempt to draw the line between art and kitsch, between serious art and trivial art or between museum holography and the everyday form of the medium, the matter of where to place that line is uncertain. Today this is a problem not only for holography but also for the understanding and interpretation of numerous other aesthetic phenomena in our society.

Inasmuch as it is possible to question the sense and meaning that a particular phenomenon represents, an answer seems possible only if we try to understand them within their own context and in relation to their aesthetic correspondence with the present. We presume that the intention is to understand holography not only as a product or a tool but much more as a statement of specific effects based on an autonomous structure of the medium itself. Consequently, an analysis of the aesthetic message of holography first has to deal with the investigation of the inherent autonomous structure of the medium. Even though such a structural analysis cannot be separated from the practice of the medium, an independent methodical procedure must be undertaken before a sociological analysis can be done. Therefore the following examples will demonstrate some

parameters of the autonomous structure.

## THE HOLOGRAPHIC PARADOX

An often-ignored peculiarity of holography is the basic difference between the hologram and the holographic image, whereby neither the one nor the other corresponds to our conception of a picture in the traditional sense.

If we assume that a picture in our ordinary conception represents an optical information system, which is decipherable by means of visual perception, then it is not difficult to recognize immediately that a hologram differs basically from an ordinary picture [4]. Even if additional optical information could be stored in a hologram, as can always be the case with a normal picture, it can never be identified *a priori* as an optical information system. We cannot decipher optical holographic information with our naked eyes, and even if we could look at it under a microscope, it would not appear as a picture immediately. Only when we hold a hologram in our hands like a mirror and move it back and forth or look at it from above and below and from the side is it possible, under optimal conditions, to discover something similar to a picture.

Unlike a normal picture, a hologram manifests itself as something that first appeals to the haptic and motoric senses and then stimulates them before it can be perceived visually. Only through the skillful interaction of the haptic with the visual, in the truest sense of the meaning of the term 'visual', does the hologram release the holographic image, which itself is in no way identical with the hologram. This is why the optical storage medium of the hologram has a certain similarity with the acoustical storage medium of a phonograph record. Technically it is wrong to say 'to listen to a record', because we really mean that we listen to acoustical signals stored on the record. The same also applies to looking at a hologram; only under certain circumstances are we able to see the optical information contained within the hologram.

As banal as this small inaccuracy may appear, it fundamentally shows the basic problem of our present relationship to holography. According to the present concept, holograms are treated like normal pictures, in spite of their basic differences, as if they should be

hung on the wall in picture frames. Thus a hologram is sometimes presented and viewed in a picture frame, which contradicts the holographic intention and, by maintaining a conventional distance between picture and viewer, perpetuates a conventional mode of perception. The viewer is not included in the sensory procedure of the development of the holographic image; rather, the image is presented in the accustomed 'frame'—in front of the viewer's eyes as if on a stage. From the beginning, the picture, as well as the viewer, is given a definite place, with the result that the perception of the holographic image occurs in an inappropriate situation and in accord with accustomed principles of visual perception. How can it be possible to discover something new in holographic images if the method of perception remains conventional?

As Panofsky has explained, the central perspective image is characterized by an existence that is purely functional rather than substantial [5]. The image attains its importance, as well as its aesthetic effect, only by its ability to produce illusions in the viewer, who may be interpreted as having a desire for illusion. Hence the viewer does not accept the image at its face value, as "a bold abstraction of reality" [6], but rather accepts it as a perfect analogy of reality [7]. Inasmuch as the picture is not in fact the reality, it is only in the method of perception that it becomes realized, and thus it cannot be separated from the illusion. This illusion produces the immediate effect of an image and simultaneously becomes a paradigmatic principle of perception, whereby the physiological process of visualization is subordinate to the psychological perception of the image [8]. At the same time, a predominance of the "perspective as a symbolic form" [9] conforms to the real, substantial composition of the picture.

This particular method of perception, which developed from the discovery of central perspective, has been maintained up to the present as a generally valid paradigm. While on the one hand the paradigm has played an important role in our *Weltbild* (philosophy of life), on the other hand its preeminence has been caricatured by numerous illusional techniques, such as optical illusions and *trompe l'oeil* effects. A consequence of this was the distinction between 'true' and 'false' images.

Since it is not the substantial existence but the special functionally ruled



relation to reality that constitutes our perception of the picture, according to Wittgenstein an "a priori true picture" cannot exist [10]. Although the image is indeed a matter of fact, it is not reality. At best it is a model or reproduction of reality. Therefore it is always necessary to make a comparison with reality in order to determine whether the image is true or false [11]. Again this presumes a certain conception of reality that, as we know, is mostly acquired through the perception of images. Thus we have come full circle in the tautology of the perception of the *Weltbild*, whose existence is founded on the paradigm of illusional perception. Holography penetrates this circle of tautology with a desire for a new kind of perception.

Superficially, the aesthetic message of holography appears as an image of both a true and a false nature. Far from being just an optical trick or *trompe l'oeil*, the image seems to unite illusion and reality. Therefore it appears both real and unreal, true and false, simultaneously. So far, what was only possible by means of illusion, i.e. the revocation of the differences between image and reality, is now resolved immediately with holography. The holographic image is capable of completely renouncing illusion. Moreover, holography confronts the principle of illusional perception with a totally new aesthetic effect and a new mode of perception, whose special characteristic is the correlation of physiological perception and psychological perception. At the same time it overcomes the purely functional existence of the image in favor of a substantial one. The situation seems to be a paradox: the holographic image, in the form of a free-floating, almost immaterial appearance without a medium and obviously without substance, frees perception from illusion and also shows the substantial existence of the perceived effect of the image.

So far, holography has only been able to show its differences in fragments, because we are still accustomed to accepting illusions. This is also the reason we still have a tendency to rediscover already-known optical illusions and games (e.g. anamorphosis, spatial stereoscopic images, phantom images) in holography, and this enables us to diminish the fear that holography produces along with its fascination. The essence of the holographic message is to overcome illusion as well as to distinguish between the holographic image and reality.

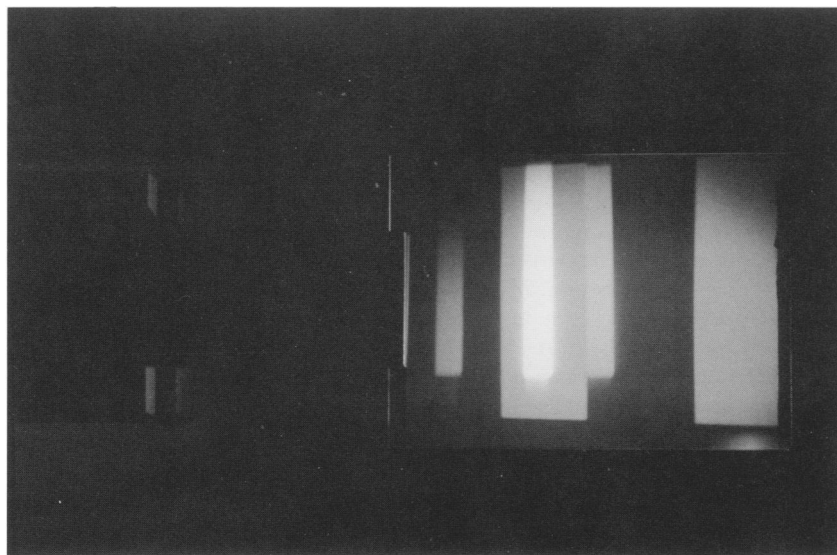


Fig. 1. Dieter Jung, *Gegens-Räume (Present space)*, white-light transmission hologram, 32 × 42 cm, 1984. Photo © Peter Zec. This hologram can only be experienced as a spatially indefinable aesthetic effect of changing colorful shadows of light.

## HOLOGRAPHIC OPTICS

The existence of holography is primarily due to the development of a totally different perception of the physical world, which has made a radical break with geometric optics [12]. From the theories of Euclid to the principles of Newton, geometric optics maintained its validity until it was re-evaluated in the late seventeenth and early eighteenth centuries with the experiments of Huygens, Young and Fresnel and with the discovery of the wave nature of light. Although these were the true precursors of the physical principles of holography, the discovery of this new medium was reserved for our own century.

If we compare holographic optics with the geometric optics of the photographic procedure, we are compelled to see them as paradoxical. Rebellious against recognized principles of ordinary imaging techniques, holography still succeeds in making the apparently impossible possible, although or perhaps just because it totally renounces the optical function of a lens. The optical (objective) lens of a camera is as foreign to holography as it is to the photographic effort for objectivity [13]. Furthermore, holography is able to put things repeatedly in another light. Still, its capability of reproducing images far exceeds that of photography. Thus holography makes possible what Gibson correctly never expected from photography when he explained that even the most technically accurate photograph cannot store all the infor-

mation that is seen, because there is an infinite amount of information. The reconstitution of the original stimuli on the retina is impossible, because the total energy of the light cannot be put on film [14].

If Gibson had holographic optics in mind instead of photography, which he criticized, he quickly would have had to change his point of view. Indeed these examples again show how much, even as critics, we still stick to a photographic perspective of visual perception.

On the other hand, with the beginning of holographic optics, Gibson's indirect postulation for a perfect representation of reality loses its authenticity and is robbed of its potential for the realization of illusionistic imagination. The meaning becomes obvious if we try to formulate Gibson's thesis in normal terminology: *It is an illusion (fallacy) that the most technically accurate photograph is able to preserve all the information that is observed.* Whether or not Gibson talks explicitly about photography, the illusion is excluded from this statement as soon as it actually succeeds in making the impossible possible. Exactly this is the case in holography, and in this manner the illusion of reality is taken away from us through the optics of holography.

## HOLOGRAPHIC SPACE

Just as holographic optics causes a radical break with geometric optics, holographic space is no longer explainable in the sense of classical Euclidean

geometry. Unlike perspective space, which left its imprint on three-dimensional visualization and thinking, holographic space is not imaginable or understandable as a purely functional mathematical construction.

Whenever holographic space appears, this appearance does not occur as an illusion of a concrete space, because this is excluded *a priori* by holographic optics. Therefore the holographic space no longer has a referential relation to reality. Moreover, it is experienced as an indefinite phenomenon, whose aesthetic effect becomes real and once again corresponds to the everyday spatial experience of a postmodern culture. This phenomenon is essentially identified by its loss of sensory experienced matter and dimensional distance [15]. At the same time, space, as it was formerly and absolutely defined in terms of above and below, as well as of front and back, ultimately becomes absurd. Although holographic space still maintains a certain depth, it is no longer measurable according to specific parameters. Rather, spatial depth becomes concrete first as an indefinite visual aesthetic effect.

Analogously to this particular experience of space represented by holography, big cities are increasingly perceived differently in numerous everyday situations. The following ex-

ample of Fredric Jameson's shows such a phenomenon:

The theme of unlimited space should not only be understood metaphorically. It can be experienced by everyone who starts in the Chicano markets in the middle of Los Angeles and climbs up Beacon Hill and then suddenly faces the gigantic free-standing wall of the Crocker Bank Centre—a surface which does not appear to be supported by any solid mass and whose apparent form (rectangular? trapezoid?) can hardly be determined with the naked eye. This large window surface whose two dimensionality seems to be resisting gravity immediately transforms the solid ground on which one is standing into part of a stereoptic image. Thus it seems we are only surrounded by stage scenery. No matter from which perspective it is viewed, the visual effect always remains the same . . . [16].

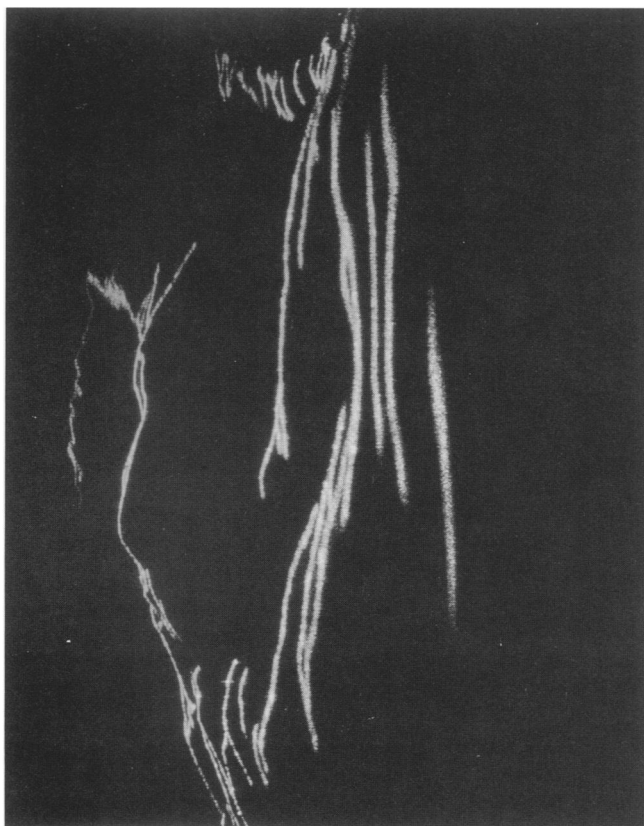
It is surprising that Jameson refers to stereoptic images instead of the holographic ones that would suit his argument much better, for the experience he describes is characterized by features that are more typical of holographic perception than of stereoptic perception. The indefinable visual effect of the apparent absence of mass of those gigantic free-standing walls of the Crocker Bank Centre perceived by Jameson is, for example, characteristic of holography. The experience of the material reality seems to shift increas-

ingly toward the perception of immaterial visual effects. As a result, we 'physically' experience that realities exist in new forms and have become 'incomprehensible' as aesthetic visual effects.

Holographic space, the third dimension of holography, stored as optical information in each hologram, cannot be referred back to any ordinary experience of space. Moreover, a logic of spatial perception unknown until now is brought into play, which can use neither the materiality of an image surface that no longer exists nor the illusory imagination of the reality of a space that likewise no longer exists as a reference. Because holographic space exists in neither an external nor an internal reality, it is its own simulacrum, "the identical copy of something whose origin never existed" [17]. This space can no more copy reality than create illusions. Both impossibilities form a basic implication of the new 'spatial logic' of the simulacrum, which is expressed in the aesthetic effect of holographic space.

Dieter Jung's *Gegenwarts-Räume* (Present space) are a series of holographic images (see Fig. 1) with which he tries to explain this new logic of the simulacrum. The effect of Jung's illuminated spaces corresponds exactly to the expressive aesthetic character of our times as already articulated in many other postmodern experiences. Hereby we realize that in the 'new space' of postmodernism, distance has been generously abolished. We are immediately so immersed in these filled-in, diffused spaces that the spatial coordinates of our postmodern bodies are now stolen from us: practically and also theoretically they are made incapable of creating distance [18].

Even time cannot help us as an obvious coordinate to measure spatial distance. It becomes meaningless and unrepresentative when we realize that, measured in time, the trip to the airport in our own city takes us longer than the flight to a much more distant place [19]. This everyday experience of the loss of the usual spatial feeling of proximity and distance finds an aesthetic equivalent in the spatial difference of a holographic image, which contains neither a definable front nor a definable back, nor any other known reference to reality. Accordingly, Jung's *Gegenwarts-Räume* can only be experienced as a spatially undefinable aesthetic effect of changing colorful shadows of light that can be experienced



**Fig. 2. Rudi Berkhout, *The New Territories*, white-light transmission hologram, 30.5 × 81.2 cm, 1984–1985. Photo © Peter Zec. The holographic image creates a new experience and perception of space that loses its concrete dimension and also its materiality. The view steps into completely 'new territories'.**





Fig. 3. Thomas Lück, *Optischer Hund* (Optical dog), white-light transmission hologram, 20 × 25 cm, 1987. Photo © Peter Zec. The optical dog demonstrates a unique relationship between a figurative (three-dimensional) and plane (two-dimensional) structure within the holographic space. This happens in a way that has never been seen before in any other medium. The same holographic image (space) is shown from three different positions (points of view).

three-dimensionally even without the perspective of depth [20].

The thesis that holographic space can be experienced in a new manner because of its lack of depth seems to contradict the superficially experienced plasticity of numerous holographic images. Upon closer examination, this means that when we actually enter the holographic space we experience it from a distance and with a diminished perspective. As a result, the space loses its concrete dimension and also its materiality. This aesthetic experience becomes understandable for us through Jung's *Gegenwarts-Räume* as well as through Rudy Berkhou's *New Territories* (Fig. 2) and Thomas Lück's *Optischer Hund* (Optical dog) (Fig. 3), all three of which can be considered prototypes of holography itself. To actually experience the holographic space in this manner it is necessary to abandon common methods of perception and points of view and free the space from our usual frame of sight.

As this actual departure from traditional visualization proves, not only theoretically but practically (primarily related to plasticity), the special result of the aesthetic effect of holographic space is based on the loss of materialization rather than on the addition of a third dimension. While holographic space loses materiality and the illusion of depth, it also attains general importance by representing the actual thinking and experience of our time.

## THE SELF-REFERENCE OF LIGHT

The aesthetic effect of holographic space as well as its substantial existence receives its self-creating energy solely from light [21]. Holography gives absolute priority to light in a new way as opposed to a referential relation to reality. Therefore holographic space no longer is related to the obvious visual, material and spatial order of things.

At the same time, light loses its corresponding function between the reality represented in the image and the actual experienced reality. Not reality but light itself assumes the function of reference. While photography in its truthness is always compared with reality, in holography the existence and reality of holographic space is dependent on light. So it is not a coincidence but a definite principle of holographic optics that light interferes with itself in holography. The hardly observable minute differences between the object beam and the reference beam produce the aesthetic message of holography, which, as is known, does not contain any materiality and is composed of light created by light.

As light is not only a generative principle but a *sujet* and the basic substance of the holographic image as well, the self-reference of light represents an essential form for the articulation of the holographic message. Holography, independent of color pigments and the referential relation to the visual mate-

rial order of things in reality, opens up a wide spectrum for aesthetic realization in its original definition (from the Greek, *aisthesis*, meaning 'sensation', 'perception'), an occurrence that was 'unimaginable' up to now, an occurrence that underlies the entirely natural appearance of our experienced reality as an energetic principle. If we consider this unique occurrence of holography from the point of view of the holographer as well as of the viewer, we discover a new aesthetic experience of our time. In this aesthetic situation, we leave the concrete materiality of nature (as Kandinsky also remarked about painting) and penetrate its *harte Hülle* (hard shell), to find its inner rhythm. At the same time, we find ourselves wanting to experience, through the medium of holography, a hitherto unknown and hardly imaginable *physikalisches Weltbild* (physical philosophy of life) and to sensitize our perception for something that in modern natural science, since Einstein and Heisenberg, is understood theoretically as relativity and quantum theory.

## CONCLUSION

It is, as should have been demonstrated, thus impossible to define the aesthetic message of holography correctly in terms of a distinction between holographic art and 'holokitsch'. Holography should really be understood as an aesthetic expression of our times. The aesthetic message discussed here is

distinguished by an immediate paradox. The holographic image appears to be a normal picture, but simultaneously the illusion of the image that normally would be expected is completely destroyed. Instead of the illusionary effect of traditional image space, the real aesthetic effect is that of a holographic space that corresponds to a simulacrum with different, characteristic ways of experiencing the present. The traditional difference between image and reality in general is overcome here and cancelled. The reason for this is the special principle upon which holography is based. There is a radical break made with geometric, perspective optics and at the same time the paradigm of objectivity as an illusion of reality is revealed.

While holographic optics are technical prerequisites for the holographic message, the aesthetic articulation of this message is performed by means of light referring back to itself. Holographic space creates the actual contents

of this message, in which physical seeing 'interferes' with the psychological way in which the aesthetic effect of holography is perceived. As we search for the newness of this medium, this interference can be fascinating as well as terrifying.

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9. Panofsky [5].

10. Ludwig Wittgenstein, *Tractatus Logico-philosophicus* (Frankfurt am Main, 1963) p. 19.
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