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Technological Constructions of Space–Time
Aspects of perception
Heike Helfert

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With the development of technical media of representation, these media simultaneously moved into the scope of artistic debates. Not only were the new communications technologies extensively studied and even further developed; the use of audiovisual media has also introduced numerous new aspects to the aesthetic engagement with questions of perception. In this fashion, new possibilities are opened up in particular for the use of temporal-spatial contexts, which are artistically explored in many new ways and forms. Using selected examples, this text describes various aspects of the aesthetic engagement with questions of perception in connection with the technical media of reproduction in the twentieth century. The first part, «Media Possibilities,» is dedicated to developments like absolute film, structural film and experimental film, each of which deals with the particular make-up and materiality of the medium. Time, a key factor in the area of audiovisual perception, will then be examined as a constitutive element of perception. The artistic representation of temporal structures is here primarily linked to the engagement with the illusion space of the cinema. In the second part of the text, the «Video Medium» is brought center stage. Here, the engagement with fundamental phenomena like time, space, and the human body will be discussed, as well as their mutual influence on the perception of these elements. Subsequently, the relationship between video and television and the contingent relation of our possibilities of perception to media technology as well as the search for perceptive experiences that transcend individual media will be explored. The third section, «Spaces of Perception,» describes examples of an extended concept of media and the extension of artistic fields of action into three-dimensional space. Here, particular emphasis will be placed on the

perspectives of mobile spectatorship and the inclusion of the body in the process of perception. The fourth and final part, «Perception Apparatuses,» deals with approaches in the area of perception studies that are influenced by science. In so doing, examples of the development and application of perception instruments under different technological conditions will be described. Finally, by way of analog and digital technologies, the phenomenon of vision with the help of technological aids will be discussed.

I Media Possibilities

The development of technical media of reproduction like photography and film in the nineteenth century engenders entirely new methods of representation and formal languages. In film and later in video, the possibility of depicting space is supplemented with the capacity to represent processes and movement. Time is thus included as an additional element in the repertoire of the representational media and opens up new aesthetic possibilities that could not have developed without fundamental technological preconditions. Walter Benjamin already emphasized in his essay on «The Work of Art in the Age of Technical Reproduction»[1] the interlinking connections between new technologies and new art forms and the resultant formation of patterns of perception. He illustrates this by means of the example of film; in techniques like slow motion and the close-up and in studies of motion, film produces a new way of observing nature and the environment. In addition, by way of technologies like editing, i.e., the structuring and recombination of images and sequences, film offers previously unknown ways of seeing. In the 1960s, the media scholar Marshall McLuhan described the increasing role of the media in our everyday life, seeing in it the foundation for an expansion of our possibilities of perception. McLuhan considers the use of media a cultural technique that links various areas of perception with one another. «The TV image has exerted a unifying synesthetic force on the sense-life of these intensely literate populations.... Radio and television...., these massive extensions of our central nervous systems[,] have enveloped Western man in a daily session of synesthesia. The Western way of life attained centuries since by the rigorous separation and specialization of the senses, with the visual sense atop the hierarchy, is not able to withstand the radio and TV waves that wash about the great visual structure of abstract Individual Man.»[2]

Nevertheless, technology is not the only factor that influences perception or patterns of perception; the specific application or aesthetic use of a technology also leads to the reorganization of our sensory perception. In an article published in the catalogue for documenta 8, the art historian Vittorio Fagone writes about the mutual relationship

between media technologies and their artistic use: «In general, technology is considered not a norm of external facts, but a <medium> for the increasing communicative possibilities of expression and design. In particular, the new informational tools possess unique linguistic powers that need to be explored in both directions: first in light of a vital exchange with the other technologies of technological image storage (like photography, cinema, and video); on the other hand in light of its own ability to develop new figurative syntheses that live from themselves [and] are multimedia audio-video. At any event, at issue are not techniques of transmission, but rather the possible definition of new materials, qualities and temporal-spatial linkages in the image.»[3]

Dieter Daniels is somewhat more general about the mutual relation between art and media: «Just as artistic genres are not only defined by their material but also by their contexts and institutions, the delimitation and production of media technologies are also based on a mix of cultural conventions and technological innovation.»[4]

The film medium

Since the beginning of the twentieth century, the development of film with its new visual qualities formed an important point of departure for the artistic study of new forms of expression and techniques of perception.[5] This was also continued in the course of the development of other media. Here, the object of these studies is usually the specific form of the media themselves and their suitability as artistic means of expression. Artists as well, especially painters, explore the aesthetic possibilities of film.[6] The light of film is considered an extension of the artistic spectrum, a means of transferring painting to the dimension of movement. Walter Ruttmann, one of the protagonists of abstract film, observes an accelerated form of intellectual engagement with information and expression caused by technological media of transmission like the telegraph, fast trains, stenography, photography, etc. He sees in this the reason for an increased concentration on temporal processes. To provide an adequate response for the new speed characteristic of the period, he calls for also integrating temporal structures into intellectual processes and the sphere of art. In his essay «Malerei mit Zeit,»[7] written around 1919, which already in the title links the various elements of expression with one another, he writes: «The gaze that in intellectual matters is increasingly driven towards a focus on a temporal occurrence can no longer find the rigid, reduced timeless forms of painting relevant.» As a solution, Ruttmann suggests «bringing an entirely new kind of life-feeling into artistic form, <painting with time.> An art for the eye that distinguishes itself from painting in that it takes place temporally (like music) and the artistic emphasis does not (as in the image) consist in the reduction of a (real or formal) process to a single moment, but precisely in the temporal development of formal

aspects. That this art develops temporally is one of its most important elements of the temporal rhythm of optic events. It will therefore produce an entirely new type of artist, up until now only latently present, positioned somewhere halfway between painting and music.»[8]

In Berlin of the 1920s, the first public showings of abstract films accessible to a broader audience take place, and immediately attract great attention. On May 3 and May 10, 1925, the now legendary film matinee «Der absolute Film»[9] is presented, including contributions by Hans Richter, Viking Eggeling, and Walter Ruttmann. Other than commenting on technical deficiencies, the critics receive these experiments in animated film quite positively, since they attribute to them a great potential of innovation. Here, the artists are less interested in developing narrative possibilities than in extending their aesthetic and usually abstract studies to the new medium of film.[10] For «Le Retour à la Raison,» already made in 1923 on the occasion of the «Soirée Dada du Coeur à Barbe,» Man Ray strewed spices, needles, thumb-tacks onto the negative, exposed it and set his «Rayograms» in motion.[11] This process of transformation, transferring real objects through their direct exposure without using a camera into moving film images, changes the composition of cinematic modes of representation, which up until then had primarily been reproductive. Film becomes a direct bearer of visual information, and thus no longer serves as a medium for reproducing an external reality. In Futurist film»[12] as well, artists experimented in part with non-objective modes of expression and subjected the film material to manipulations like scratching or painting of the material surface. But the technique of animation, which to a large part has to be done by hand, makes the production of purely abstract films quite arduous. Only a few years later, film compositions like Walter Ruttmann's «Berlin. Die Sinfonie der Großstadt» (1926–1927) emerge; these do not have abstract film material as their foundation, but rather use documentary film images and are supported by the strong rhythmification of the images. But, due to the rise of Fascism and the poor economic situation, as well as the «lack in cooperation and solidarity» within the avant-garde movement and the «impatience with the difficulties of a new technology,» abstract film in Germany soon came to an end.[13]

At the start of the 1970s, the tendency of engaging with film's material foundation is again picked up with structural film, which expressly makes its form its content. Here, the emphasis on the material character of film and the study of the physiology and psychology of film perception play a central role. Most structural films work with simple basic forms like static shots, zoom, or light effects to make the spectator conscious of the preconditions of film technology. From the point of view of the

physiology of perception, film is based on the laziness of the human perceptive apparatus. Images projected one after the other in a rapid sequence fuse into one continuous movement. Inspired by the occupation with specific qualities of film projection, like pulsating light, is Tony Conrad's «The Flicker» (1966); Conrad was already known as a musician. The film exclusively consists of a structured series of black and white individual images, which in projection only appear as the rhythmic change of light and dark and correspond to no optical image. This formalism of light-rhythms causes in the spectator a consciously provocative irritation of perception that can produce after-images, seeing spots, and similar phenomena; in a certain sense, this is the transmission of the early cinema's flicker to a nervous stimulation of the brain.[14]

Michael Snow's 1967 film «Wavelength» also seeks to raise our awareness of the foundations of processes of perception and deals with formal issues rather than narrative content. Through the structural deconstruction and reconstruction of cinematic structure, he points to precisely that what he does not provide, that is the illusionism of narrative film. «Snow's goal is to bring the spectator to the fullest possible recognition of both qualities of the cinematic image: its referential nature as representation of the visual world and its essential nature as, in Snow's words, «projected moving light image».»[15]

In general, experimental films do not intend to reproduce reality, but to interpret it or to expose how we perceive it. In particular the representative function of film is critiqued when the self-referentiality of film images takes the place of extra-cinematic referentiality.

All the same, the proponents of structural film with their formal intentions do not receive the same public attention as their art colleagues fifty years earlier with their avant-garde films. «If in the 1920s, visual artists became filmmakers, in the 1970s the circle closes: the filmmakers become visual artists. Highly praised by the critics, experimental film disappears into the ivory tower of art, far from the audience.»[16] Although film's composition and its operation as a medium remain an issue in experimental film, its importance since the end of the 1970s has declined noticeably. Thus, between 1983 and 1989, using «found footage material,»[17] the group Schmelzdahin, which understands itself as a «film production collective,» impressively stage the materiality of film and at the same time its aesthetic process of dissolution. For this they use old sequences of Super-8 films, a technology that had long ago ceased to be a medium of everyday use; its typical area of application had already been

replaced by the general use of home video. Here, film material is subjected to biochemical processes by burying it in the garden, storing it in a pond, or overheating it. The results of these natural processes of decay or aging are then copied back onto film and thus conserved in the state of their dissolution. In the 1984 film »Stadt in Flammen,« the scenes melt due to overheating, producing an infernal image impression of disappearance. «The images no longer show a figuratively represented scene, but rather its dissolution as a temporal process.»[18]

Film time

In the use of audiovisual media, the dimension of time plays a special role. The interpretation of a photograph as a depiction of an individual moment or a film sequence as a representation of a temporal process presumes certain conventions of representation and perception. In order to emphasize time as a special, constitutive element of perception, the usual patterns of perception in the individual media are broken through or subverted. This becomes particularly clear in various artistic engagements with the illusionary space of the cinema. By transferring temporal processes to a temporal medium that stands still (like photography), artists like Hiroshi Sugimoto or Jim Campbell are able to visualize representational structures of time. Here, the relationship of time to space is often central to these studies of perception. In so doing, the means of conventional photography serve more or less the fusion and condensation of temporal processes, while digital technology allows a layering and superimposition of individual temporal segments. With the help of light, Hiroshi Sugimoto illustrates the condensation of time. In his photographseries «Theaters,» which he has been working on since the 1970s, he exposes the cinema as a site that shapes space and time with light. Usually, the architectural space of the cinema steps into the background as soon as the light of the projector is turned on. Sugimoto, however, condenses the entire film on one photo, inverting the relationship of real space to illusionary space. He exposes his photographs over the entire course of a film showing, and thus returns film to its foundation, that is, light. The entire film is thus contained in a single photo, but due to the long exposure time the screen only appears as a bright surface. All that remains visible is the physical space of the cinema. A similar goal is pursued by Jim Campbell in his work «Illuminated Average #1 Hitchcock's Psycho» (2000) by storing the temporal course of a film on one single slide. But he works with digital, and not analog, technology. At issue is thus not the duration of exposure that produces a certain amount of light, but the addition of individual film images and their data. Here, image after image are superimposed on one other, producing a concentration of light and contrast that only allow the outlines of a

plot to be glimpsed in the less strongly illuminated parts of the image. In this process, time manifests itself as light and the superimposition of different degrees of brightness.

The Scottish artist Douglas Gordon is interested in the extreme deceleration of temporal structures, almost to the point of dissolution. The relationship of inner and external perception structures his work «Five Years Drive-By,» first shown in 1995 at the Biennale de Lyon.[19] In this work, Douglas Gordon dissects the Western classic «The Searchers»[20] into its cinematic components, that is, individual images. By extending the projection time of the film to the time span of the represented plot, which however encompasses a time frame of five years, it is no longer possible for the viewer to follow the dramaturgy of the images. What remains is a sequence of individual images fourteen minutes in length; each is replaced by the following image, almost entirely unchanged. Since we cannot follow the content, the cinema itself and the excessive representation of its protagonists become the central issue. In contrast to the usual cinema experience, cinematic time seems almost to stand still, while the subjective time experience of the observer and the media perception itself move to the center of attention.[21]

Andy Warhol deals just as rigorously with the relationship between cinema, time and cinematic conventions. Many of his films are narratives without narrative interventions; although they represent an occurrence in time, they refuse plot development or a climax. Usually they are reduced to one subject and filmed with a fixed, unmoving camera. «Empire» (1964), for example, shows the same shot of the Empire State Building for eight hours, while only the daylight changes. With this, Warhol subverts fundamental cinematic structures like the representation of movement or the use of narrative elements. In a certain sense, due to its unchanging content, the film image is relieved of its representative function, representing movement in time. The question, «and what happens next?» already becomes superfluous after the first minutes, as soon as it is clear that nothing will happen that would approach a cinematic climax. Warhol thus constructs an essentially documentary situation, which however refers more to its own situation of reception than to the content of what is represented. He thus produces a synchronicity of filming time, represented time, and the time of reception, which, precisely due to the refusal of dramatic possibilities, moves the perception of time and the expectant posture of the audience—the product of media conventions—to the center of attention. Much more interesting than the question of what happens in the film is here the question of what happens in the audience.

In his «empire 24/7,» Wolfgang Staehle adds additional components to the concept of

synchronicity: the simultaneity of the real object and its permanently, generally available reproduction. Twenty-four hours a day, seven days a week, a web cam shows a real-time image of the immobile, iconic building on the Internet. Media reality can thus be experienced as a real-time event. Permanently available, and without an original, the digital image of the Empire State Building links the site of <filming> with the site of the observer, and thus shows a reality typical of live web cam images, one which usually lies outside our realm of perception.

II The Video Medium

Reflecting on the medium of video by illuminating its possibilities leads from the very beginning towards a debate on an academic, technical and artistic level. Technical as well as artistic experiments and inventions lead to new forms of image production. Again, visual artists who usually work with other media are the first to dedicate themselves to the new technology. For instance, many sculptors and performance artists expand their means of representation with the use of video in their works and exhibitions.[22] The intermedia character or the reciprocal influence of art and media rests, however, less on technical aspects than an interest in complexes of social communication. Thus, technical execution is not central to artistic production, rather the way in which the medium is used and what can be shown with it.

Closed-circuit

The immediate accessibility of the video images and the simultaneous possibility of their manipulation by delay or spatially separate playback is a special characteristic of video. Many artists have made use of this technique in their work. Installations and arranged situations emerge that include the viewer in the representative situation. The special relationship of the simultaneity of reality and depiction forms a basis for so-called closed-circuit situations. Such an arrangement refers to a closed situation of representation in which the recording medium (the camera) is linked directly with the medium of representation (for example a monitor). Often an object or a person is simultaneously confronted with his own image. Observers thus experience the synchronicity of their actions with their depiction, as in a mirror, but this time not reversed. They thus no longer find themselves either within a current situation, which they experience as the present, or its time-delayed representation, which has more the character of reminder or documentary, but rather in a media-extended reality. The visitor thus becomes both actor and spectator.

With the use of the closed-circuit technique, situations for perceptive experiences between architectural and media space can be produced, which are then made current by the presence of the observer. An early and important work in which the visitor is integrated in the installation is «Wipe Cycle» by Frank Gillette and Ira Schneider (1969).

In addition to its role as a mirror, video is also used in its function as an instrument of surveillance. In contrast to the mirror, the video images are dependent on the position of a recording camera, not on the position in relation to the reflected object. This means self-perception is mediated through a camera eye that can change the perspective in an irritating way, as in Peter Weibel's installation «Beobachtung der Beobachtung: Unbestimmtheit» (1973).

Time space body

The effect of technologically mediated self-perception through a camera is particularly powerful in spatial situations that include the observer. For example, Bruce Nauman produces in «Live-Taped Video Corridor» (1969–1970) irritations of the experience of space and time caused by the feeling of physical presence or absence. Nauman specifically emphasizes in his arrangement the aspect of dependence of physical impressions in perceptions of time. In contrast, Dan Graham thematizes time as a dimension that can be experienced in space. With his installation «Present Continuous Past(s)»[23] he treats the relationship of spatial and temporal experience. Perception usually takes place in the present. We are thus not in the position of perceiving things past or future. Graham constructs a space that makes the phenomenon of constantly continuing presence available to experience by visualizing temporal distance in space. While Nauman and Graham precisely emphasize breaks and discontinuities in the experience of time, Bill Viola produces in his installation «He Weeps For You»[24] (1976) the experience of continuity, constancy, and the connections between micro- and macrostructures. He produces a space of experience based on total perception. In so doing, he addresses «archetypal» notions like the inexorable cycle of renewal, and produces a situation of perception that is directed towards primeval forms and patterns for conceiving human life. By focusing the gaze on a constantly falling and acoustically amplified water drop, Viola shows the smallest events magnified many times over, thus directing attention towards the observation of constancy and one's own consciousness.[25] The personal experience of a continuous time is thus amplified by the observation of the constantly newly emerging drop that reflects the observer.

Video/TV

In the early phase of the medium, the confrontation with individual experiences of perception was less prominent than the interest in the general possibilities video offered for aesthetics and communication technology. Many artists were more interested in an approach that focused on media analysis. Due to its technological proximity to television, video art was often seen as an intersection between art and commercial mass communication. Particularly in the beginning, the ambivalent relationship between video and television was treated by many artists. Reflections emerged of the medium television through intentional delimitation, imitation, subversion, manipulation, appropriation, destruction, alienation, etc. Usually the communication process itself was central in these works.[26] Nam June Paik, one of the pioneers of video art, had already in 1963 in the Wuppertal exhibit Exposition of Music—Electronic Television confronted television as a means of mass communication and the disturbance or breaking its conventional one-way character.[27] Ahead of his time, lacking video technology, he showed technically manipulated TV devices with electronically distorted images. The audience was thereby invited to undertake manipulations of their own and thus actively participate in the image process («Participation TV»). Later he developed «TV-Buddha» (1974), a closed-circuit video installation, today considered an icon of media art. A Buddha statue «meditates,» self-reflexively confronted with its own image. Not distraction, but a being absorbed in contemplation and the unavoidable confrontation with one's own image are the principle of this work—an early form of media deceleration and decompression. In large video installations, Paik also takes the reverse route, and emphasizes in a flood of information and irritations the redundancy of the media. He thereby uses the electronic medium as a means of unlimited reproduction and uses permanent self-citation as a principle of construction that can be seen throughout his entire work.[28]

In the 1960s, a drive towards a growing exchange between academic methods, technical executions and artistic approaches of experiential appropriation increasingly emerges. Technological renewals in the area of mass communication are seen as a chance to develop a mass culture. Aldo Tambellini, who in 1968 together with Otto Piene produced the live television art show «Black Gate Cologne,» expressed this in almost enthusiastic terms. «Technology and culture are mutually related to one another. We have changed from an industrial-electronic to a communication-information society. By way of telecommunication, we see one another from screen to screen, and we become one with the new perception of the world. The electromagnetic spectrum must be seen as a natural source of creative activities. Transmitted information is the

new form of art.»[29]

Many artists in search of aesthetic forms of expression used the then current technological possibilities or even transcended them, thus helping to construct them. Since the 1970s, these included in particular the confrontation with habits of vision. Thus in 1971 David Hall broadcasts under the title «TV Interruptions» a series of visually irritating film sequences without commentary in public television, during which, for example, the monitor seems to fill with water, but then surprisingly in a 90-degree camera angle again seems to empty, disturbing the expectation of a constant perspective. With these kinds of interventions in visual conventions, Hall breaks the continuum of television reception in the domestic screen.

In his film and video project «Ten Works» (1973–1977), Wojciech Bruszewski represents audiovisual studies, in which he suspends the usual synchronicity of image and sound tracks and thus places their linkage to disposition. The spectator is more ready to accept a post-synchronized film than a division of the unity of image and sound that is assumed to be natural, although this unity is produced by the medium.[30]

Video as an immaterial medium

The study of aesthetic characteristics of video technology and the occupation with optic alienation effects leads also to the confrontation with video as a pure light form. In contrast to film, the image information is based on electromagnetic information that is only available to human perception by means of technical apparatuses. The video image offers thereby significant possibilities of manipulation. Peter Campus stages in «Three Transitions» (1973–1977) situations of perception that are impossible in reality. By taking various perspectives that cannot be perceived simultaneously and linking them to one another, he questions the structure of natural space. In one sequence, Campus walks through his own image. The viewer thereby becomes a witness of his own deception. Campus questions natural physical laws by seemingly breaking through them. In so doing, he makes use of the nature of the video image as divorced from material conditions. By connecting truly divergent standpoints that can be simultaneously represented by the simultaneity of video playback, he produces an artificial unity of time and space. Campus' starting point for these situational arrangements is his «interest in time spaces and the accumulation of perspectives, their transition and transferal of light and electricity, the feedback of his own, projected image, and the balance and amalgamation of differences, their common sources are not directly to be perceived.»[31]

Our possibilities of perception in the media are dependent on the state of media technology. This influence on our visual habits, molded by experience and technology, is also emphasized by Dieter Kiessling in his installation «Pendelnder Fernseher» (1983). Usual relationships of representation are here apparently reversed. In a feedback situation between camera and monitor, which displays its technical construction quite openly, he poses riddles on the mechanics of perception. In order to understand what he or she is seeing, the observer must confront both the difference and the mutual dependence between the physical situation and its media depiction.

Technical manipulations

Our visual habits change analogously with the technical alteration of the media of reproduction. Besides the real time playback possibilities it offers, video's meaning for the changed perception of the world is based in the possibility of real-time manipulation, allowing an intervention in the image already during recording. The interest in the direct manipulability of images and thus in the visual interpretation and production of the world has challenged various artists to a series of technical experiments and inventions.

With his video «Artifacts» (1980), Woody Vasulka systematically summarizes the results of his experimental studies and presents the vocabulary developed in the process. Here, the foundation of these studies of video technology is no longer the image as a whole, but a half-image as a structuring unity. Seen from the standpoint of current visual habits, themselves based on a constantly improving technological foundation, the revolutionary character of these images only becomes clear in a historical context. By developing electronic image tools and using these technologies, Woody Vasulka, often together with Steina Vasulka, has been developing technologically and aesthetically new kinds of forms of digital image production and manipulation since the 1970s.[32] In part, these anticipate an electronic image language that ten years later is part of everyday television. Often, these developments would emerge in collaboration with engineers and technicians. In the area of image production and manipulation, artists like Nam June Paik (in collaboration with the technician Shuya Abe) or Ed Emshwiller also explored the technical possibilities of image editing, and in so doing further developed them, for example the Paik/Abe Synthesizer[33] (1969), which is named after them. In 1970, Stephen Beck developed the so-called Direct Video Synthesizer, which makes possible a direct influence of elements like color, form, movement, and even the illusion of depth. With this, images could be

produced that approached optical hallucinations, something then more commonly found in psychedelic film, which questioned the constants of perception by way of visual effects.

«Although not long lasting, there was a period in video when the subject of representation was discussed, resembling the dialog between musique concrète and the Synthesizer or the Bazinian discourse of cinematic reality. The appropriation of images was the topic; those taken from God/Nature through the camera versus those constructed inside the instrument. There was a clear interest in machine-made forms as far away from nature as possible. The synthetic principle was the talk of the day.»[34]

Since the invention of electronic technologies, the opposition between synthetically produced and recorded aesthetic material has played a role in various artistic areas. In the area of the visual there is the opposition of film and synthetic image, while in the acoustic area, musique concrète (for example, the work of Pierre Schaeffer and Pierre Henry) is opposed to electronic music (Karlheinz Stockhausen).[35] The use of images or sounds that maintain a link to external reality is here opposed to the artistic new creation of visual and acoustic elements of expression. Similar to the images in abstract film, video works that are purely electronically produced, like «Artifacts,» have no representative intention. Their function is self-referential and indexes their own technique of image production.

Over the course of the 1980s, the interest in the study of video as a medium has declined. Questions about perception and technology that until then were extensively studied are overshadowed by an interest in narrative forms[36] and subjective expression.

III Physiological Effects and Extensions

The interrogation of ordinary perceptual experience is also illustrated in attempts to connect various areas of perception with one another or to trace out sensory experiences in the area of consciousness. Works like «Tap Dance»[37] by Willie Walker or «Tunnel» (1999) by Thomas Demand point to the link between sensory perception and cognitive experience. By provoking particular associations, they allude to the mechanisms of perception, which almost unavoidably produce certain impressions, but are nonetheless physically not represented. What one imagines one is perceiving is not really shown. Willie Walker plays with the supplementary knowledge of the observer when he performs a tap dance in which only his upper body is visible in

the image; he produces the sounds with his mouth. Thomas Demand takes abstraction a step further when he sends the viewer on a camera ride through a paper model of the tunnel in which Princess Diana was killed in a car accident. The information stored from the repetitions of the images of the site of the accident in the mass media produce while watching the feeling of being the witness of a situation that, although really hardly seen by anyone, seems to be part of the collective consciousness.

In contrast to more or less analytic observations in the visual media, artists like Jan Peter E. R. Sonntag in his installation «modern minimal disco» (since 1995) or Granular Synthesis in their performance «POL» (1998) exert direct influence on the physical perception of the spectator and produce synaesthetic experiences. By transferring sensory impressions from one medium to another, as with the transformation of sound to vibration, the usual link of their mode of representation to certain media is broken through and extended into other areas. In installations or performances, they make sounds physically felt and add an additional sensory element to acoustic perception.

Perception spaces

The interest in the study of optical phenomena has also always existed beyond the framework of classical communication media like film and video as well. An extended concept of media art leaves behind the borders of pure image transmission and brings other means of expression into the artistic process. This can include architectural structures just as much as light or sound. Usually at issue is extending perception studies into the three dimensions, surpassing the two-dimensional possibilities of image media.

In the 1960s, performance is increasingly used as an apparatus for the sensory perception of space.[38] In the so-called Expanded Cinema,[39] which more or less describes everything that goes beyond usual film production and projection technologies, conventional formal languages are also broken by the extension of film into space. Often, art and technology are here linked to one another as equals; new projection technologies are tested and the audience is integrated into the event. Joachim Paech describes the utopia of this movement as «a new avant-garde with which the cinema would be extended into all areas of information and communication, the performative and knowledge, or to put it briefly, social and cultural life. On the one hand, art becomes a medium of social information; at the same time, the new media similarly carry out their task of information with artistic means, whereby information is

generally identified with transformation.»[40]

«Movie Movie»[41] (1967) was such an environmental action with film that staged processes of perception as an event with many flexible components. A spatial body filled with compressed air becomes a mobile transparent projection surface formed by using the bodies of the equally mobile audience. The dynamic relationship of the individual factors like architectonic space, observer and image to one another produce a variable visual experience that stages the image as part of architecture. The extension of the experience of reality here intended corresponds to the mood of the time (in part influenced by drugs) and by integrating the observer anticipates immersive perception spaces, which are usually computer supported.[42]

Peter Weibel, himself an important proponent of the action-referential art of this period, describes the then current notion of media situations as such: «The classical film system with its basic figures and rules—projector, projection surface, sound track, director, camera, camera movement, editing machine, montage, camera position, screen curtain, etc.—was conceived as a convention that could be changed at any time, a system of variables. Instead of the projector a mirror, instead of the stream of light a cord, instead of the screen a mirror, instead of the screen a thorax, instead of electric light fire, instead of light reactions chemical reactions, one can work with or without celluloid, in the cinema or outside it, with or without screen, with moving or static screen, with the camera as projector, with the people as screen, etc.»[43]

The technological further development of computer technology makes it possible today to re-execute the concepts of the 1960s and 70s in spatial and active integration of the beholder in the artwork with technological means. Jeffrey Shaw, for example, one of the initiators of inter-media events like «Movie Movie,» resumes the participative approaches in computer supported virtual (projection) environments.

Light and movement

An extended concept of media art also encompasses the use of light and movement as artistic material. Already in the 1950s, artists of the group ZERO like Heinz Mack, Otto Piene and Günther Uecker worked with light as an artistic medium. Their intention was to return painting to its conditions, that is, in particular light as a foundational element. In so doing, however, they abandoned the technique of painting with paint and canvas and formed spatial works that threw shadows or reflections and included movement in their concept. Works emerged that created an impression that changed according to the

point of observation. Instead of color or other formal components, Heinz Mack considered spatial organization and movement as the true form of artistic work.[44]

Particularly the inclusion of the variable perspective of the viewer is an important component of many space-referential art works. While the visitor walks through a space, there is no fixed point that provides an optimal perspective of perception. Movement and orientation in space are thereby an intended element of the visitor's experience.

Since the 1970s, James Turrell[45] has been creating installations that make the immaterial, that is, light, physically available to experience. These light spaces cause intensive visual events and often pose perspectivist riddles to the visitor. In his spatial installations, which can be entered by the viewer, he dissolves the connection between optically perceptible spatial depths and the experience of spatial dimensions, engendering the impression of finding oneself in an infinite field of pure colored light. Turrell's light spaces thus not only treat vision itself and the mutual play between illusion and perception, but show through a lack of optical and spatial orientation at the same time the body as a site of perception. In his «Perceptual Cells» (1991), Turrell provides the participatory variant of these stagings of perception. The observer enters in a small closed perception capsule, where with the help of buttons and regulators he can test sensory stimulations.

Sound

Starting from the body as a site where perception manifests itself, Olaf Arndt and Rob Moonen use sensory deprivation to show in their isolation space «Camera Silens» (1994) that it is impossible to not perceive anything.[46] Protected from external influences, perception concentrates on one's own body noises. John Cage, whose thinking was influenced by Asian philosophy, allowed himself to be inspired to one of his most famous works through the experience in an isolation tank. The realization that the lack of external influences does not lead to absolute silence, but a concentration on interior sensory experiences that are suppressed in everyday perception is the concept of the piano work «4'33"»[47] which was premiered in 1952. The title corresponds to the length of the piece, during which however no single piano tone sounds. Instead of using the keys, the pianist shuts the cover of the keyboard and thus produces a supposed silence, which is multiply interrupted by the opening and closing of the piano lid. What thereby can be heard are the sounds of the spectators like rustling, coughing, heckling and the like.[48]

The technique of briefly interrupting silence with the banging of wood in order to subsequently experience the silence all the more intensely is used in the art of traditional Japanese sound gardens. In a creek, a wooden vessel attached to a kind of see-saw fills in regular intervals with water; this then shifts the balance, and when the see-saw hits the bottom it produces a sound that contrasts the dominant peaceful atmosphere with its brief small shock of the pleasure in the sounds of the garden all the more. It is not clear whether John Cage was familiar with this traditional technique.

IV Perception Apparatuses

In engaging questions of perception, the use of scientific research suggests itself. At the intersection between scientific and artistic work, instruments that stretch from simple analog machines to technically quite complex apparatuses are systematically tested and developed. In particular, technologically produced perspectives are studied, but also perception spaces that extend into yet unseen areas.

Florian Kleinfenn and Fritz Rahmann illustrate the use of perception technologies and their influence on our experience of the world in a manner that is just as simple as it is impressive. For their «Watteau-Projekt,» made for documenta 8 (1987), they transformed an automobile into a mobile camera obscura,[49] and thus explore their surroundings. Orientation, the foundation of action, is only provided with the assistance of mediated perception, that is, the upside down representation of their surroundings inside the car. Technical innovations and optical apparatuses like the camera obscura have always challenged artists to engage with such instruments of perception. Usually, however, at the center of interest is not the aspect of the medially mediated perception, as is true here, but the occupation with optical phenomena.

Since the 1960s Alfons Schilling has been studying the physical and optical characteristics of vision, and developed as a result so-called «vision apparatuses» to test stereoscopic sight. What emerged thereby were the most various optical systems that concern themselves with spatial sight in connection to movement, like the «Dunkelkammerhut,» a large portable camera obscura that includes the entire body in the process of perceiving the surroundings. In 1973, under the title «Video-Head-Set» Schilling develops a head mounted display, as had also been presented by Ivan Sutherland at the end of the 1960s; an apparatus in which the user wears two small monitors placed in front of the eyes and thus could have the impression of moving in various spatial and temporal dimensions. However, the technology available at the time had not yet reached a sufficiently advanced state, so that Schilling's development

remained a mere prototype. Nevertheless, these vision machines can be considered mental and technological predecessors of current virtual reality constructions. Here, a trend emerges from the previous technologically simulated representation of movement to the actual experience of movement in space. «The basic experience, decisive for the future of vision, that perception through an apparatus makes possible a new perception of space and time. ... In classical vocabulary: illusory bodies move in illusionary spaces and can be driven by the beholder through the apparatuses. This is the basic concept of cyber-space.»[50]

But vision with the support of technological aids does not correspond to the usual impression of vision and has to be learned, as for example the mobile camera obscura shows. From looking through a simple optical device like a pair of glasses to the accelerated perspective of a train ride up through the representation of a zoom, in which the gaze gradually approaches a distant point, the interpretation of sensory impressions first has to be learned. This is especially true of technically produced vision, which produces images that diverge from natural vision. Even what we experience as natural vision is not an inborn function, and like other fundamental skills, like walking or speaking, requires some practice. Already at an early stage of life, human beings thus learn to analyze sensory impressions and to interpret the information won from it—a decisive foundation for human orientation.

Since the mid-1980s, the almost unlimited manipulation of images has become possible by combining the computer with video technology. Video images can be produced divorced from external reality. In a simulated reality, thus the significance of familiar perceptive constants can dissolve, since they are tied to no physical laws, when variables like scale, spatial dimensions or colors can be arbitrarily manipulated.

Tamás Waliczky makes use of this in his computer animation «The Garden» (1992) to illustrate how perception is a learned ability. He designs a world that is hypothetically bound to the perspective of a child that still has to learn the interpretation of environmental information like distances and size relations. The viewer is thereby integrated into a perception perspective produced by computer technology that Waliczky calls the «Water-dRop Perspective.»[51] All the same, at issue here is not the psychologizing representation of subjective or psychedelic perception. The perspective constantly remains a 360° comprehensive field of perception, imposing the same optical dimensions on all surrounding objects. Lev Manovich writes on the relationship of a virtual camera to virtual surroundings: «[T]he camera and the world similarly function as parts of a single gestalt, creating an effect which is larger than the sum of

the individual parts. ... Waliczky's virtual camera operating [sic] not only as a tool of perception but also as a tool of epistemology.»[52]

The spectrum of possible perspectives of observation or perception was extended with the introduction of technical apparatuses of vision to those areas of perception that go beyond natural human vision. A technologically produced perspective of perception, nevertheless tied to an actual seeing subject, is presented by Jochem Hendricks in his series of «eye drawings.» With the help of an «eye-tracking system,»[53] the eye movements of a person are registered while the person looks through infrared, video and computer technology; these movements are then transmitted to a representation in lines. In this way, graphics emerge that make individual perception externally visible, whereby the perception organ simultaneously becomes the instrument of expression. The technically produced image as an affect of the reading of a newspaper or by the visual scanning of a portrait—is thus always tied to the natural perspective of a human standpoint of observation.

At the opposite end of the spectrum of technical visual aids is the abandonment of the natural human perspective. Devices that enable a view of reality not available to the naked human eye often come from the areas of medicine or science. These include microscopes that make the smallest elements visible, X-ray devices or sonar, which allow a view in the inside the body,[54] or telescopes that enable gazing into outer space.

Art+Com has developed a system that not only opens a view on a certain detail of our world but under use of a complex data system enables comprehensive viewing of our earth. «Terravision,» a freely navigable, computer-driven global system, uses no abstract cartographic data, but rather real satellite images to represent the world. The user of this program can view the Earth from almost any random perspective and any desired distance. He can direct his gaze directly towards a certain point on earth and approach it with increasing detail precision. From the satellite image to the detail image of a target, the point of view of this recording device does not correspond to the human point of observation. This liberated perspective suggests instead the notion of a worldwide surveillance capability, or an almost divine overview, which transcends the natural human ability of observation and vision by using technical means. Satellite images or other systems of inscription supposedly independent of human manipulation suggest due to their primarily scientific use the representation of an objective reality.

But even those images that apparently infinitely extend our perceptive ability require

our interpretation. Such an interpretation cannot be fully divorced of worldview or ideological foundations. As observers, we are always part of the system to be studied and merely in this influence the results of the study. Our perception is thus always tied to our own (mental or physical) perspective, from which we cannot separate ourselves; artists can make the technical, aesthetic or social coding of this perspective available to experience.

Translation by Brian Currid

- [1] Cf. Walter Benjamin, «The Work of Art in the Age of Mechanical Reproduction,» in *Illuminations. Walter Benjamin. Essays and Reflections*, Hannah Arendt (ed.), Harry Zohn (trans.), New York, 1969.
- [2] Marshall McLuhan, «Television,» in *Understanding Media*, London, 2002[1964], pp. 343–344.
- [3] Vittorio Fagone, *Kontinuität und Wandel im Verhältnis zwischen Kunst und Technologie im 20. Jahrhundert*, in exhib. cat. documenta 8, vol. 1, Kassel, 1987, p. 31.
- [4] Dieter Daniels, «Inter (-disziplinarität, -media, -aktivität, -net),» in *Bilder in Bewegung*, Kai-Uwe Hemken (ed.), Cologne, 2000, p. 137.
- [5] On the development of artistic film in the twentieth century see Birgit Hein/Wulf Herzogenrath (eds.), *Film als Film 1910 bis heute*, Stuttgart, 1977.
- [6] Cf. the text «Media - Art/Art - Media.»
- [7] W. Ruttmann, «Malerei mit Zeit,» (written ~1919), cited in *Film als Film*, op. cit., pp. 63–64.
- [8] Ibid., p. 64.
- [9] Cf. Holger Wilmesmeier, *Deutsche Avantgarde und Film: Die Filmmatinee <Der Absolute Film,>* diss. Heidelberg, 1993; Münster/Hamburg, 1994.
- [10] Since the films that emerged out of this are largely based on the rhythmification of abstract forms, the term «visual music» is also used as a description.
- [11] Peter Tscherkassky, «Weißes Rechteck und Schwarzes Quadrat: Über das Verhältnis von Film und bildender Kunst,» in exhib. cat. *An der Front der Bilder. Kinematographie als Kunst*, Vienna 1998.
- [12] Cf. the passage from the manifesto: «The Futurist Film,» 1916.
- [13] Holger Wilmesmeier, (1994), op. cit., p. 187.
- [14] Cf. Julia Schmidt, «Federleichte Beschaffenheit des Bildes,» in *Neue Zürcher Zeitung*, October 20, 2001.
- [15] William C. Wees, *Light Moving in Time*, Berkeley/London, 1992, p. 155.
- [16] Ingo Petzke, «Kurze Geschichte des Experimentalfilms,» in *Grid*, no. 17, Frankfurt/Main, July 1997.
- [17] Found footage refers to already existing film or images that serve as the starting point for other artistic works.
- [18] Joachim Paech, «(Avantgarde-) Film und Entropie—Oder: Ordnung und Unordnung in der Filmgeschichte,» lecture for the conference «Das frühe Kino und die Avantgarde,» Vienna, March 2002.
- [19] At the end of 2002, the project was shown in its full length near Oslo on the grounds of the Norwegian telecommunications company Telenor.
- [20] Director: John Ford, USA 1956, starring John Wayne.
- [21] Douglas Gordon himself says on this «How can one film, which lasts only 2 hours possibly convey the fear, the desperation, the heartache, the real <searching and waiting and hoping> How can anyone even try to sum up five miserable years in only 113 minutes? Now, its important to say that this is not a criticism directed at John Ford, nor the motives behind making the movie. But, for me, it does open up a gap in the way we experience the experience of cinema,» in exhib. cat. *3e Biennale d'art contemporain de Lyon*, 1995, p. 372.
- [22] Cf. the text «Reality/Mediality.»
- [23] Passage from Dan Graham, «Video in Relation to Architecture,» in *Illuminating Video*, Doug Hall/Sally Jo Fifer (eds.), New York, 1990, pp. 185–186.

- [24] Cf. Bill Viola, note on «He Weeps for You,» 1976, in *Reasons for Knocking at an Empty House, Writings 1973–1994*, London, 1995, p. 42.
- [25] Cf. Bill Viola: «Video Black–The Mortality of the Image» in *Illuminating Video*, op. cit., p. 482.
- [26] Cf. Gerda Lampalzer, *Videokunst: historischer Überblick und theoretische Zugänge*, Vienna, 1992.
- [27] For more on this see the text «Television—Art or Anti-art?»
- [28] Cf. Edith Decker, *Paik. Video*, Cologne, 1988.
- [29] Quoted in Bettina Gruber/Maria Vedder, *Kunst und Video*, Cologne, 1983, p. 198.
- [30] On the critique of the «formalization» of our perception in television, cf. Peter Weibel's work «TV News (TV-Tod 2)» (1972).
- [31] Peter Campus quoted in Gruber/Vedder (1983), op. cit., p. 88.
- [32] See their extensive online archive.
- [33] Relevant here as well is the work of Keith Sonnier, who is also known for his use of light. In his video works «Animations II» (1974), he presents the result of computeraided image animation.
- [34] Woody Vasulka in exhib. cat. *Eigenwelt der Apparate-Welt (Pioneers of Electronic Art)*, The Vasulkas/David Dunn (eds.), Ars Electronica, Linz, 1992, p. 122.
- [35] Cf. the text «Audio Art.»
- [36] Cf. the text «Virtual Narrations.»
- [37] «Tap Dance,» a three-minute video sequence from 1972, black and white, sound, from *The Weekend Tapes*, by Willie Walker.
- [38] Cf the text «Reality/Mediality.»
- [39] Cf. Gene Youngblood, *Expanded Cinema*, New York, 1970
- [40] Joachim Paech (2002), op. cit.
- [41] The originators of this action were Theo Botschuijver, Jeffrey Shaw, Tjebbe van Tijen and Sean Wellesley Miller, who in a similar constellation under the group name Eventstructure Research Group realized additional experiments and actions with flexible architecture, pneumatic spatial bodies and image projections between 1967 and 1979.
- [42] Cf. the text «Immersion and Interaction.»
- [43] Peter Weibel, «Jeffrey Shaw: a user's manual,» in *Jeffrey Shaw—a user's manual*, Anne-Marie Duguet et al. (eds.), Ostfildern, 1997, pp. 11–12.
- [44] Passage from Heinz Mack, «Resting Restless» (1958), in *Theories and Documents of Contemporary Art*, Kristine Stiles / Peter Stelz (eds.), Berkeley/London, 1996, p. 410.
- [45] Passage from James Turrell, «Mapping Spaces» (1987), in *ibid.*, p. 574.
- [46] A situation in which the perception of external stimuli and sensory impressions is blocked (sensory deprivation).
- [47] Cf. Nam June Paik «Global Groove,» sequence with John Cage.
- [48] Cf. the text «Television—Art or Anti-art?»
- [49] The camera obscura is considered a predecessor of the photograph camera. Literally, it means «dark chamber.» In a small chamber otherwise sealed off from any outside light, the only light falls through a small hole that can also be fitted with a lens. The image, which is thus projected to the outside world, appears upside down and reversed. This technique transmits a representation of reality (live and in motion) from the outside to the inside, and was in the mid-sixteenth century often used as the basis for painting. In a certain sense, this entailed a manual storage process of the representation.
- [50] Peter Weibel, «Anatomie des Sehens,» in *Alfons Schilling, Ich, Auge, Welt—the art of vision*, Vienna, New York, 1997, p. 121.
- [51] Passage from Tamás Waliczky, «The Garden (an Amateur Film of the 21st Century),» in *Interface 2*, Klaus Peter Denker (ed.), exhib. cat., Hamburg, 1995, p. 361.
- [52] Lev Manovich, «The Camera and the World: New Works by Tamás Waliczky,» 1998.
- [53] An instrument for capturing eye movement. There are mobile eye tracking systems, which are worn like a data helmet directly before the eyes. Here, the principle of head-mounted display is turned into its opposite. The user of such a system receives no visual information, but rather produces information through the movement of his eyes. The user here is a producer rather than a consumer.
- [54] The Australian performance artist has been literally «sounding out» the relationship between technology and the

human body. In his «Stomach Sculpture,» he has been transmitting video images of the inside of his body recorded with sonar towards the outside world in the beginning of the 1990s. Cf. the text «Reality/Mediality».

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