1

Introduction

"The most elemental process of modern times is the conquest of the world as images."
—Martin Heidegger, *Holzwege*, p. 92. Frankfurt: Klostermann (1980).

"Das Wahre hat keine Fenster. Das Wahre sieht nirgends zum Universum hinaus. Und das Interesse an Panoramen ist, die wahre Stadt zu sehen. . . .—Die Stadt im Hause. Was im fensterlosen Hause steht, ist das Wahre. [The interesting thing about the panorama is to see the true city—a city inside a building. What stands in the windowless building is the truth . . . (the truth has no windows; nowhere does it look out upon the universe.)]"
—Walter Benjamin, *Das Passagenwerk. Gesammelte Schriften*, vol. 5, 2, p. 1008. Rolf Tiedemann (ed.). Frankfurt/Main: Suhrkamp.

What is virtual art? Never before has the world of images around us changed so fast as over recent years, never before have we been exposed to so many different image worlds, and never before has the way in which images are produced changed so fundamentally. To an unprecedented degree, so many utopian expectations are intertwined with so much skepticism. The scale of recent and current encroachment of media and technology into the workplace and work processes is a far greater upheaval than other epochs have known, and, obviously, it has also affected large areas of art. Media art, that is, video, computer graphics and animation, Net-art, interactive art in its most advanced form of virtual art with its subgenres of telepresence art and genetic art, is beginning to dominate theories of the image and art. We are experiencing the rise of the computer-generated, virtual spatial image to image per se, to images that appear capable of autonomous change and of formulating a lifelike, all-embracing visual and sensory sphere. As yet, digital art still exists in a state of limbo, rather like photography before Stieglitz. The evolution of media of illusion has a long history, and now a new technological variety has appeared; however, it cannot be fully understood without its history. With the advent of new techniques for generating, distributing, and presenting images, the computer has transformed the image and now suggests that it is possible to "enter" it. Thus, it has laid the foundations for virtual reality as a core medium of the emerging "information society." Since the end of the 1980s, new interfaces communicate three-dimensional images using the head-mounted display (HMD) or the more recently developed CAVE[1] (fig. 1.1). The suggestive impression is one of immersing oneself in the image space, moving and interacting there in "real time," and intervening creatively.

Virtual reality was discovered early on by artists, who appropriated it with their own methods and strategies. Through cooperation with many leading representatives of virtual image culture and their international media labs, but also extensive research in archives, this book rests on much unpublished source material. Media artists represent a new type of artist, who not only sounds out the aesthetic potential of advanced methods of creating images and formulates new options of perception and artistic positions in this media revolution, but also specifically researches innovative forms of interaction and interface design, thus contributing to the development of the medium in key areas, both as artists and as scientists.

Figure 1.1 *CAVE*. Electronic Visualization Laboratory, University of Illinois, Chicago. Developed by Dan Sandin, Carolina Cruz-Neira, et al. By kind permission of Dan Sandin.

Art and science are once more allied in the service of today's most complex methods of producing images.

The new art media are also having far-reaching impacts on the theory of art and the image. In this context, this book endeavors, first, to demonstrate how new virtual art fits into the art history of illusion and immersion and, second, to analyze the metamorphosis of the concepts of art and the image that relate to this art. Art history, as the oldest discipline concerned with images, has the resources of a broad material base to analyze these concepts, including recent developments connected with computers. Although art history and the history of the media have always stood in an interdependent relationship and art has commented on, taken up, or even promoted each new media development, the view of art history as media history, as the history of this interdependent relationship that includes the role of artistic visions in the rise of new media of illusion, is still underdeveloped. Yet art's close relationship to machines in particular and technology in general, including the new media of images and their distribution, spans all epochs, from classical antiquity to the present day.

In many quarters, virtual reality is viewed as a totally new phenomenon. However, a central argument of this book is that the idea of installing

an observer in a hermetically closed-off image space of illusion did not make its first appearance with the technical invention of computer-aided virtual realities. On the contrary, virtual reality forms part of the core of the relationship of humans to images. It is grounded in art traditions, which have received scant attention up to now, that, in the course of history, suffered ruptures and discontinuities, were subject to the specific media of their epoch, and used to transport content of a highly disparate nature. Yet the idea goes back at least as far as the classical world, and it now reappears in the immersion strategies of present-day virtual art.

Further, it is the intention of this book to trace the aesthetic conception of virtual image spaces, their historical genesis, including breaks, through various stages of Western art history. It begins with the broad, primarily European tradition of image spaces of illusion, which was found mainly in private country villas and town houses, like the cult frescoes of the Villa dei Misteri in Pompeii, the garden frescoes in the Villa Livia near Primaporta (ca. 20 B.C.), the Gothic fresco room, the Chambre du Cerf, and the many examples of Renaissance illusion spaces, such as the Sala delle Prospettive. Illusion spaces also gained in importance in the public domain, as evidenced by the Sacri Monti movement and the ceiling panoramas of Baroque churches. One of the most exceptional vehicles for painted illusionism is the panorama, patented by Robert Barker in 1789. Paul Sandby's landscape room at Drakelowe Hall (1793) was a direct response to this invention. All these examples of image spaces for creating illusions are not, obviously, technically comparable with the illusions now possible with the aid of computers, which the user can experience interactively. However, this study shows clearly how, in each epoch, extraordinary efforts were made to produce maximum illusion with the technical means at hand. Before the panorama, there were successful attempts to create illusionist image spaces with traditional images, and after its demise—together with many artistic visions that never left the drawing board—technology was applied in the attempt to integrate the image and the observer: stereoscope, Cinéorama, stereoptic television, Sensorama, Expanded Cinema, 3-D, Omnimax, and IMAX cinema, as well as the head-mounted display with its military origins.

This book does not interpret virtuality per se as an anthropological constant, for then it would begin with the cave paintings of Cluvet, Altamira, and Lascaux. Instead, attention centers on 360° images, such as the

fresco rooms, the panorama, circular cinema, and computer art in the CAVE: media that are the means whereby the eye is addressed with a totality of images. This book engages with media in the history of art that concentrate on immersive image spaces.

The activation, or "domestication," of the human senses lay with changing forms of art and media; however, "the will to art" pursued comparable categories. The image spaces and media discussed here are the subject of many treatises, but never before have they been examined in the context of an art-historical analysis of the concept of immersion. So far, there has been no historically comparative or systematic theoretical approach to virtual realities. I endeavor to summarize and categorize existing work to present a coherent theoretical framework and analyze the phenomenologies, functions, and strategies of all-embracing image worlds to provide a historical overview of the idea of virtual reality. It is not a comprehensive history of this phenomenon nor of perception, although certain findings are of interest in this respect: it is a portrayal of the continuity of this idea and a characterization of its applications in the history of art.

The panorama demands special consideration for two reasons: first, this illusion space represented the highest developed form of illusionism and suggestive power of the problematical variety that used traditional methods of painting. The panorama is also exemplary in that this effect was an intended one, a precalculated outcome of the application of technological, physiological, and psychological knowledge. With the contemporary means at hand, the illusion space addressed the observer as directly as possible; this latter was "implicit." Second, the study of the panorama can help to lay the foundations of a systematic comparison, where the metamorphosis of image and art associated with computer-aided virtual reality emerges in a clearer light. The case study presented here of perhaps the most important German panorama (and political event), *The Battle of Sedan* by Anton von Werner (1883), has not been analyzed in this detail before and reveals in exemplary fashion the strategies for removing boundaries and psychological distance between observer and image space. Further, the normative forces of economics and their constraining effect on the role of the artist is examined, together with the artist's position within the configuration of coworkers, image techniques, and the interests of the client. How and with what effect does the strategy of immersion operate here, which methods are implemented, in what intensity and with which in-

tentions vis à vis the audience? The in-depth depiction of these mechanisms is, at the same time, a prehistory of the immersive procedures of computer virtual reality.

Integration of virtual reality into the history of immersion in art must not lead to disregard of the specific characteristics of virtual computer art, which, as Theodor W. Adorno warned, may be negated in the interests of drawing comparisons: "All the same, nothing is more damaging to theoretical knowledge of modern art than its reduction to what it has in common with older periods. What is specific to it slips through the methodological net of 'nothing new under the sun'; it is reduced to the undialectical, gapless continuum of tranquil development that it in fact explodes. . . . In the relation of modern artworks to older ones that are similar, it is their differences that should be elicited."[2] It is precisely to crystallize this specificity, this difference, that the second focus of this study engages with the metamorphosis of the concept of the image under the conditions of computer-generated virtual image spaces as driven by, for example, interface design, interaction, or the evolution of images.

In virtual reality, a panoramic view is joined by sensorimotor exploration of an image space that gives the impression of a "living" environment. Interactive media have changed our idea of the image into one of a multisensory interactive space of experience with a time frame. In a virtual space, the parameters of time and space can be modified at will, allowing the space to be used for modeling and experiment. The possibility of access to such spaces and communication worldwide via data networks, together with the technique of telepresence,[3] opens up a range of new options. Images of the natural world are merged with artificial images in "mixed realities," where it is often impossible to distinguish between original and simulacrum.

The media strategy aims at producing a high-grade feeling of immersion, of presence (an impression suggestive of "being there"), which can be enhanced further through interaction with apparently "living" environments in "real time." The scenarios develop at random, based on genetic algorithms, that is, evolutionary image processes. These represent the link connecting research on presence (technology, perception, psychology) and research on artificial life or A-Life (bioinformatics), an art that has not only reflected on in recent years but also specifically contributed to the further development of image technology.

In this book, examples of artistic illusion spaces are discussed in depth and against the outline of this historical tradition, the transformation engendered by the digital media, which has enduring effects on the internal structure of the relationship between artist, work, and observer, and is exemplified by analyses of contemporary virtual reality installations. Analogies and principal differences in art production, image/work phenomenology, and audience reception are revealed. This comparative approach is best suited to provide insights into the aesthetic innovations of this medium, with its growing societal and artistic importance, and the new status of the image under the hegemony of the digital. Recent but already well-known works of virtual computer art are integrated here for the first time within a broad art historical context. The intention is not to establish this young branch of art's credentials in terms of historical legitimation but rather to demonstrate the recurring existence of the intermedia figure of immersion together with its intentions and problematic potential. I am not suggesting that virtual reality should be viewed in terms of a prehistory of logical developments leading up to it; what is described here are individual and varied stages, each representing in contradictory, disparate, or dialectic form a new status of perception vis à vis older media. With these historical foundations, the study aims to facilitate comparison and enable critique of contemporary developments, emancipated from current media propaganda, both futuristic and apocalyptic—no more, no less. The approach is intentionally broad, linking historic media art with digital art in the hope of better understanding the quality of the new art form and contributing to the emerging science of the image by distilling some basic aspects of a history of media of illusion and immersion.

In a historical context, this new art form can be relativized, adequately described, and critiqued in terms of its phenomenology, aesthetics, and origination. In many ways, this method changes our perception of the old and helps us to understand history afresh. Thus, older media, such as frescoes, paintings, panoramas, film, and the art they convey, do not appear passé; rather, they are newly defined, categorized, and interpreted. Understood in this way, new media do not render old ones obsolete, but rather assign them new places within the system.[4]

Interactivity and virtuality call into question the distinction between author and observer as well as the status of a work of art and the function

of exhibitions. Therefore, it is important to determine which characteristics of virtual image systems distinguish them from images of traditional artworks or cinema. It is necessary to explore and analyze the new aesthetic potential that technology has made possible. What new possibilities of expression are open to the artist working with computer-aided, interactive, real-time images? What constraints does the technology impose on artistic concepts? What new potential for creativity does it make available to the artist and to the observer? How can the new relationship between artist and observer be characterized, and which artistic strategies result from this situation? How do interaction and interface design affect reception of the work? And finally, on the basis of knowledge of art history, how should the concepts of contemporary virtual art be assessed?

This book does not attempt to equate historic spaces of illusion with contemporary phenomena of virtual reality in order to construct a historical legitimation of the latest trends in art. Instead, the new art of illusion is investigated and relativized historically and, in a further step, analyzed and assessed. My contention is not that virtual art from the computer is always directed at maximizing illusion. However, it must be said that it does operate within the energy field of illusion and immersion—the paradigm of this medium. Whether the individual artists are critical of this aspect or implement it strategically, nevertheless, it remains the foundation on which this art operates.

The visualization potential of virtual artworks exceeds by far a purely mimetic view. The visualizations of complex systems, which the majority of artists in this book strive for, encompass a potential for creativity and image techniques that demand analysis. How are the observers affected by the kaleidoscope of endogenous viewing perspectives and the tension between physical and abstract experiences?

The creation of expanded image spaces experienced polysensorily and interactively, which enable processual situations, promote the trend toward performance art. In this way, the categories of game and game theory gain new significance. Thus, in addition to presenting the long and complex tradition of the concept of immersion, it is essential to portray the most recent dynamic changes that have taken place in images, brought forth by the new options of interaction and evolution.

From the point of view of both technology and art theory, it is illuminating to take an in-depth look at internationally acclaimed works that are

already classics of the new image culture. Here we'll discuss further important parameters of virtual art, such as the interface,[5] interaction,[6] and image evolution.[7] The interface, which connects the human senses to the image worlds of virtual art, is the main focus of the chapter on *Osmose* (1995), a work by the Canadian artist Charlotte Davies that is particularly relevant with regard to this parameter. Interaction and image evolution, or the creation of artificial life in the form of images, a highly topical and controversial theme in view of recent developments in gene technology, robotics, and nanotechnology, are discussed with reference to examples of genetic art. The contention is that these factors mold not only the artistic options of expression but also the experience of the observer, the level of participation and immersion. A question that needs to be asked in this connection is whether there is still any place for distanced, critical reflection—a hallmark of the modern era—in illusion spaces experienced through interaction. I show how immersion techniques, such as the vanishing interface, or the so-called natural interface, affect the institution of the observer and how, on the other hand, strongly accentuated, visible interfaces make the observer acutely aware of the immersive experience and are particularly conducive to reflection.

Media art has been promoted institutionally since the 1980s. In addition to the tradition of strong engagement in this area in the United States, with the foundation of new media schools in Cologne,[8] Frankfurt, and Leipzig and the Zentrum für Kunst und Medientechnologie[9] in Karlsruhe, Germany is a heartland of media art, together with Japan and its new institutes, such as the InterCommunication Center in Tokyo[10] and the International Academy of Media Arts and Sciences[11] near Gifu. More recently, other countries, such as Korea, Australia, China, Taiwan, Brazil, and especially the Scandinavian countries, have founded new institutions of media art. In spite of this considerable activity at the institutional level, museums have only begun to open their doors hesitantly to the art of the digital present.[12] Media art, which put in its first appearance at festivals,[13] has rapidly found public acceptance; yet so far, museums have neglected to build up systematically any collections. There are gaping holes, in both collections and academic engagement with this art, which will not be easy to close in the near future. A further problem is that the longevity of digital art depends on its storage media. The permanent process of changing operating systems, for example, means that it is no longer possible to

show some works that are not even ten years old. Perhaps like no other art genre in history, the continued existence of media art is in danger. Trained curators and conservators are almost entirely lacking as are any concepts for systematic collection, for example, in cooperation with computer centers, technical museums, or manufacturers of technical equipment.

The Science of the Image

For the last ten years, there has been an ongoing discussion about the status of the image in art history, philosophy, and cultural studies,[14] which has gained in topicality and brisance through the advent of media art. The new media, and particularly the art realized through and with them, demand that this question be posed with new intensity and with a new quality. Currently, no other image medium polarizes the discussion about the image more radically than virtual reality. Yet what, precisely, distinguishes the images of media art from those of bygone ages?

The rapidly spreading virtual techniques have acquired influence over many and diverse areas of scientific disciplines, the majority of which lie outside the sphere of art. To attempt a closer understanding of the phenomenon of virtual realities and contribute to the theoretical debate on the so-called iconic turn or pictorial turn,[15] I attempt to trace at least in part the long and complex tradition of this image concept and to sketch its vitality and almost revolutionary character that is emerging through the potential of interaction with and evolution of images. It is imperative to leave aside approaches that are technology-centered and, instead, situate the artistic images of virtual reality within the history of art and the media, although it is necessary to treat aspects of how the latest technology of illusion functions. Regarded historically, it is possible to relativize the phenomenon of virtual reality and determine what makes it unique. Through historical comparisons, it is possible to recognize and describe more clearly analogies or innovations. This is an attempt to take stock, in a clear and level way, on the basis of art history without invoking apocalyptic scenarios, for example, as Neil Postman, Jean Baudrillard,[16] or Dietmar Kamper[17] have tended to do, or indulging in futuristic prophesies, of the variety associated particularly with the "Californian Dream."[18]

The project of a science of the image, in which this book is involved, deliberately pursues a policy of transgressing established boundaries of specifically "artistic images." It is at liberty to comprise elements of

Warburg's early sketch of a science of the image based on cultural history, Panofsky's "new iconology," as well as the studies on vision by Norman Bryson[19] or Jonathan Crary.[20] Since the 1960s, discussion of the concept of image representation has expanded enormously. Starting point was the groundbreaking work of Nelson Goodman,[21] Roland Barthes,[22] and Ernst Gombrich.[23] Since then, studies and analyses of the concept of the image, which used to operate exclusively on the terrain of art history, have been undertaken in disciplines such as psychology, physiology, aesthetics, philosophy, cultural studies, visual studies, and computer science. Particularly in art history, the oldest discipline engaged with images and media, the interrogation of the concept of the image has burgeoned; interestingly, this has been in parallel to the rapid developments in the field of the new media and their image worlds.[24] Currently, to take an expression of Walter Benjamin's, media art history has "the wind of world history in its sails." The emerging discipline of a science of the image complements the history of the science of artistic visualization,[25] the history of the art and images of science,[26] and, particularly, the science of the image as it is pursued in the natural sciences.[27]

Inspirations for this book are the studies on visualization in the Cartesian tradition, in Martin Jay's expression "the ocular character of all Western culture,"[28] and Guy Debord's fundamental critique in *The Society of the Spectacle*.[29] However, I have drawn primarily on the theoretical discussions of interactive media art at congresses such as the Inter-Society for Electronic Art,[30] SIGGRAPH,[31] Ars Electronica,[32] the Centre for the Advanced Inquiry in the Interactive Arts[33] (CAiiA)/Newport, Interface,[34] and many other interdisciplinary meetings.

For several years, the dramatically changed function of images wrought by the new media has been a subject of cultural studies research. Some of the most imporant work in this field is by Roy Ascott,[35] a visionary theoretician whose published work on interactive computer art goes back many years. At the Centre for the Advanced Inquiry in the Interactive Arts (CAiiA-STAR), where Ascott is director, many of the most important contemporary media artists are studying for Ph.D.s.[36] The early work of Myron Krueger[37] also belongs in this canon together with the research work of Eduardo Kac,[38] Machiko Kusahara,[39] Simon Penny,[40] Erkki Huhtamo,[41] Margret Morse,[42] and the overviews of immersive works edited by Mary Anne Moser[43] that commenced publication in the mid-

1990s at the Banff Centre. In Japan, the research and analysis conducted by Itsuo Sakane,[44] founding director of IAMAS, is of prime importance; unfortunately, very little of his work has been translated. An eloquent history of concepts of space since Roger Bacon—not of immersive image worlds—has been written by the journalist Margret Wertheim.[45]

Immersion

Immersion is undoubtedly key to any understanding of the development of the media, even though the concept appears somewhat opaque and contradictory. Obviously, there is not a simple relationship of "either-or" between critical distance and immersion; the relations are multifaceted, closely intertwined, dialectical, in part contradictory, and certainly highly dependent on the disposition of the observer. Immersion can be an intellectually stimulating process; however, in the present as in the past, in most cases immersion is mentally absorbing and a process, a change, a passage from one mental state to another. It is characterized by diminishing critical distance to what is shown and increasing emotional involvement in what is happening.

The majority of virtual realities that are experienced almost wholly visually seal off the observer hermetically from external visual impressions, appeal to him or her with plastic objects, expand perspective of real space into illusion space, observe scale and color correspondence, and, like the panorama, use indirect light effects to make the image appear as the source of the real. The intention is to install an artificial world that renders the image space a totality or at least fills the observer's entire field of vision (fig. 1.2). Unlike, for example, a cycle of frescoes that depicts a temporal sequence of successive images, these images integrate the observer in a 360° space of illusion, or immersion, with unity of time and place. As image media can be described in terms of their intervention in perception, in terms of how they organize and structure perception and cognition, virtual immersive spaces must be classed as extreme variants of image media that, on account of their totality, offer a completely alternative reality. On the one hand, they give form to the "all-embracing" ambitions of the media-makers, and on the other, they offer the observers, particularly through their totality, the option of fusing with the image medium, which affects sensory impressions and awareness. This is a great difference from the nonhermetic effects of illusionistic painting, such as trompe l'oeil,

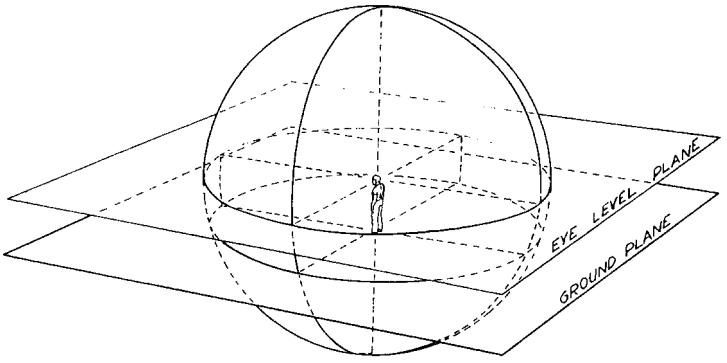

Figure 1.2 *Spherical Field of Vision.* Drawing by John Boone. In Karen Wonders, *Habitat Dioramas: Illusions of Wilderness in Museums of Natural History,* Uppsala: Almqvist and Wiksell, 1993, p. 207. By kind permission of Karen Wonders.

where the medium is readily recognizable, and from images or image spaces that are delimited by a frame that is apparent to the observer, such as the theater or, to a certain extent, the diorama, and particularly television. In their delineated form these image media stage symbolically the aspect of difference. They leave the observer outside and are thus unsuitable for communicating virtual realities in a way that overwhelms the senses. For this reason, they do not form part of this study.

Of the two main poles of meaning of the image, representative function and constitution of presence, it is the second that concerns this study. The quality of apparently being present in the images is achieved through maximization of realism and is increased still further through illusionism in the service of an immersive effect. The image and simulation technique of virtual reality attempts to weld traditional media together in a synthetic medium that is experienced polysensorily. The technological goal, as stated by nearly all researchers of presence, is to give the viewer the strongest impression possible of being at the location where the images are. This requires the most exact adaptation of illusionary information to the physiological disposition of the human senses.[46] The most ambitious project intends to appeal not only to the eyes but to all other senses so that the impression arises of being completely in an artificial world. It is envisaged that this kind of virtual reality can be achieved through the interplay of hard- and software elements, which address as many senses as possible to the highest possible degree with illusionary information via a

"natural," "intuitive," and "physically intimate" interface.[47] According to this program of illusion techniques, simulated stereophonic sound, tactile and haptic impressions, and thermoreceptive and even kinaesthetic sensations will all combine to convey to the observer the illusion of being in a complex structured space of a natural world, producing the most intensive feeling of immersion possible. Virtual reality may not be in the headlines any longer, but it has become a worldwide research project.[48] As soon as the Internet is able, image spaces will be available online that at present can be seen only in the form of elaborate and costly installations at festivals or in media museums.

The expression "virtual reality"[49] is a paradox, a contradiction in terms, and it describes a space of possibility or impossibility formed by illusionary addresses to the senses. In contrast to simulation, which does not have to be immersive and refers primarily to the factual or what is possible under the laws of nature, using the strategy of immersion virtual reality[50] formulates what is "given in essence," a plausible "as if" that can open up utopian or fantasy spaces.[51] Virtual realities—both past and present—are in essence immersive. Analog representations of virtual realities appear oxymoronic when multifarious virtual spaces are viewed in sequences or when they are partially visible simultaneously. Unresolvable contradictions have the power to irritate and distress, but they can also mature into full-blown artistic concepts, as in the case of mixed realities. Immersion in the artificial paradises of narcotics, for example, as described by Charles Baudelaire,[52] dream journeys or literary immersions past and present (in Multi User Dangeous [MUDs] or chat rooms),[53] refer mainly to imagination addressed through words, as expressed by the concept of *ekphrasis*.[54] They differ fundamentally from the visual strategies of immersion in the virtual reality of the computer and its precursors in art and media history, which are the subject of this book.

Mimesis, in the Platonic sense, mimics. The more lasting the effect, the less abstract it is; it is able, simultaneously, to be evident in a creative sense and to represent the intelligible.[55] The concepts of trompe l'oeil or illusionism aim to utilize representations that appear faithful to real impressions, the pretense that two-dimensional surfaces are three-dimensional. The decisive factor in trompe l'oeil, however, is that the deception is always recognizable; in most cases, because the medium is at odds with

what is depicted and this is realized by the observer in seconds, or even fractions of seconds. This moment of aesthetic pleasure, of aware and conscious recognition, where perhaps the process of deception is a challenge to the connoisseur, differs from the concept of the virtual and its historic precursors, which are geared to unconscious deception. With the means at the disposal of this illusionism, the imaginary is given the appearance of the real: mimesis is constructed through precision of details, surficial appearance, lighting, perspective, and palette of colors. From its isolated perfectionism, the illusion space seeks to compose from these elements a complex assembled structure with synergetic effects.

In connection with the concept of mimesis, it is worthwhile to recall another, ancient image concept, which goes back to to precivilized times. This is the original meaning of the German word for picture or image, *Bild*, with its etymological Germanic root *bil*: its meaning refers less to pictoriality and more to living essence; an object of power in which resided irrational, magical, even spiritual power that could not be grasped or controlled by the observer (in Ancient Greek, *dia zoon graphein* also comprises an element of the living), an aspect that so far has received little attention in image research.

In spaces of illusion, the moving observer receives an illusionary impression of space by focusing on objects that move toward or away from him. The depth of a painted space, however, is experienced, or presumed, only in the imagination. Gosztonyi defines the experience of space as follows: "The virtuality of the movement must be emphasized; one can also 'enter' the space virtually, i.e., in thought or imagination, whereby the distances are not actually experienced but rather *assumed*."[56] The technical idea that is virtual reality now makes it possible to represent space as dependent on the direction of the observer's gaze: the viewpoint is no longer static or dynamically linear, as in the film, but theoretically includes an infinite number of possible perspectives. The word *cyberspace*, coined by the science fiction writer William Gibson in 1984, derives from *cybernetics* and *space*, and could be given as cybernetic space. Gibson understood cyberspace to be an array of networked computer image spaces, a matrix, which as "collective hallucination" would find millions of users daily.[57] The subculture, which rapidly grew up around the idea of virtual reality in the late 1980s, co-opted this term, which plays only a minor role in this study.[58]

In virtual space, both historically and in the present, the illusion works on two levels: first, there is the classic function of illusion which is the playful and conscious submission to appearance that is the aesthetic enjoyment of illusion.[59] Second, by intensifying the suggestive image effects and through appearance, this can temporarily overwhelm perception of the difference betwen mage space and reality. This suggestive power may, for a certain time, suspend the relationship between subject and object, and the "as if" may have effects on awareness.[60] The power of a hitherto unknown or perfected medium of illusion to deceive the senses leads the observer to act or feel according to the scene or logic of the images and, to a certain degree, may even succeed in captivating awareness. This is the starting point for historic illusion spaces and their immersive successors in art and media history. They use mutlimedia to increase and maximize suggestion in order to erode the inner distance of the observer and ensure maximum effect for their message.

Even six-year-old children are able to differentiate between reality and "as-if worlds,"[61] yet in Western art and media history there is a recurrent movement that seeks to blur, negate, or abolish this differentiation using the latest imaging techniques. It is not possible for any art to reproduce reality in its entirety, and we must remain aware that there is no objective appropriation of reality—Plato's metaphor of the cave shows that. It is only interpretations that are decisive. This has been one of the major themes in philosophy in the early modern era: the work of Descartes, Leibniz, and Kant can also be viewed as marvelous attempts to reflect on the consequences that result from perspective, the mediation of perception and thus the cognitive process, which ultimately cannot be overcome. Further, artificiality and naturalness are also concepts of reflection. They denote not objects but views, perspectives, and relations.[62] In addition to copying it, the transformation of reality is the central domain and essence of art: the creation of reality, individual reality, collective reality.[63] Interestingly, recent findings in neurobiology propose that what we call reality is in fact merely a statement about what we are actually able to observe. Any observation is dependent on our individual physical and mental constraints and our theoretical scientific premises. It is only within this framework that we are able to make observations of that which our cognitive system, dependent on these constraints, allows us to observe. In

what way and to what extent there have been attempts to create "reality," virtual reality, with the means of the image in art history, is elucidated in this study.

In the following, I shall introduce some exceptional examples of enclosed virtual illusion spaces taken from different epochs in history. It goes without saying that this is not an exhaustive account of the phenomenon. My intention is to demonstrate the continuing presence of this image form in the history of European art, and the examples have been selected because they make the most intensive use of the illusion techniques of their time. The aim is to shed light on the visual strategies and specific functions of virtual spaces in the history of the art and media. Although hundreds of seventeenth- and eighteenth-century illusion spaces exist in the palaces and villas of Europe, to which access is difficult in the majority of cases, little research has been undertaken, and where research does exist, other questions tend to be in the foreground.[64] In particular, the transmedia continuum of their function, the enduring tendencies to enclose and immerse the observer regardless of the form of the medium, has not been recognized, and will be emphasized in what follows.

Notes

1. The CAVE (Cave Automatic Virtual Environment) is a cube of which all six surfaces can be used as projection screens, surrounding the visitor(s) inside with an image environment. Wearing "shutterglasses," light stereoglasses, the users see the images in 3-D (Cruz-Neira et al. 1993).

2. Adorno (1973), p. 36 (Engl. trans., Adorno 1997, p. 19).

3. Grau (2000).

4. Friedrich Kittler, "Geschichte der Kommunikationsmedien." In Huber et al. (1993), pp. 169–188 (see p. 178).

5. Bolt (1984); Laurel (1990, 1991); Deering (1993); Halbach (1994B); Grau (1997b).

6. On human-machine communication, see: Krueger (1991), MacDonald (1994), Smith (1994) (technological); Ascott (1989, 1992), Rötzer (1989, 1993),

Huhtamo (1996, 1997), Dinkla (1997) (art theory); Weibel (1989a, 1991a, 1994a) (affirmative); and Grau (1994) (critique).

7. On introducing "life" to artificial spaces (through genetic algorithms, agents, etc.), see: Goldberg (1989); Ray (1991); Schöneburg (1994); Thalmann (1994); Steels et al. (1995); Sommerer and Mignonneau (1996, 1997).

8. 〈http:www.khm.de〉.

9. 〈http:www.zkm.de〉.

10. 〈http://www.ntticc.or.jp/〉.

11. 〈http://www.iamas.ac.jp/〉.

12. These include the Centre Pompidou, MOMA, Bundeskunsthalle, Henie Onstad Kunstcenter, and the Wilhelm Lehmbruck Museum.

13. Ars Electronica, 〈http://www.aec.at〉; Interactive Media Festival, Siggraph, 〈http://www.siggraph.org/s98/〉; imagina, 〈http://www.ina.fr/INA/Imagina/imagina.en.htm〉; the Biennales in Kwangju, 〈http://www.daum.co.kr/gallery/kwang/han/index.html〉; Lyon, Nagoya, 〈http://www.tocai-ic.or.jp/InfoServ/Artec/arte〉; and St. Denis, 〈http://www.labart.univ-paris8.fr/index2.html〉.

14. See, for example, Mitchell (1995); Freedberg (1989); Belting (1990); Bredekamp (1995, 1997a,b); Crary (1996, 1999); Jay (1993); Manovich (2001); Stafford (1991, 1998); and Stoichita (1998).

15. Jay (1993); Mitchell (1995b); Bredekamp (1997a). See also the early reflections of Bryson (1983), pp. 133ff. Mitchell's book in particular has become one of the poles in this debate. Although he was not the first to point out the growing influence of visuals on modern societies, he situates their images as tied to the discourse of power that appears primarily in textual form. Following Panofsky, he proposes an overhauled iconology, which explains the images in terms of interrelationships of mutual dependence on texts.

16. Baudrillard (1996) continues to develop his position, first formulated in the 1970s, that denies contemporary technical images any reference to the factual,

which is covered by his concept of hyperreality. This "crisis of representation," a "mimesis without foundations," however, does not necessarily differ qualitatively from the conditions of representation found in older image media.

17. Kamper (1995).

18. One example among many from the media theorist Youngblood (1989), p. 84; see also Walser (1990).

19. Bryson (1983).

20. Crary (1992, 1999).

21. Goodman (1968).

22. Barthes (1980).

23. Gombrich (1982).

24. Examples are: Belting (2001); Böhm (1994); Bredekamp (1997a); Didi-Huberman (1999); Freedberg (1989); Grau (1997a, 2000b); Elkins (1999); Kemp (2000); Stafford (1998); and Stoichita (1998).

25. Kemp (1990).

26. Latour (1996); Sommerer and Mignonneau (1998a); Kemp (2000).

27. The congress on "Image and Meaning," held in the summer of 2001 at MIT, was an expression of the natural sciences confronting the phenomenon of digital images and can be viewed as the founding event of this new discipline.

28. Brennan and Jay (1996).

29. Debord (1983).

30. 〈http://www.artic.edu/~isea97〉.

31. 〈http://helios.siggraph.org/s2001/〉.

32. 〈http://www.aec.at/〉.

33. 〈http://CAiiAmind.nsad-newport.ac.uk/〉.

34. 〈http://www.interface5.de/〉.

35. Ascott (1966, 1999).

36. CAiiA-STAR is a research platform that integrates two centers of doctoral research: CAiiA, the Centre for the Advanced Inquiry in the Interactive Arts, at the University of Wales College, Newport; and STAR, the center for Science, Technology, and Art Research, at the School of Computing, University of Plymouth. CAiiA was established in 1994 as an outcome of the success of the country's first interactive arts degree. STAR was formed in 1997, building on the School of Computing's research achievements in the domain of interactive multimedia and the associated fields of artificial life, robotics, and cognitive science.

37. Krueger (1991a).

38. Kac (1996).

39. Kusahara (1998).

40. Penny (1995).

41. Huhtamo (1996).

42. Morse (1998).

43. Moser et al. (1996).

44. Sakane (1989).

45. Wertheim (1999).

46. Heeter (1992); Kelso et al. (1993); Slater and Usoh (1993, 1994a); Schloerb (1995); Witmer (1998); Stanney (1998).

47. Steuer (1992); Gigante (1993a); Rolland and Gibson (1995).

48. This is borne out by institutions such as the National Research Agenda for Virtual Reality, supported by ARPA, the Air Force Office for Scientific Research, Army Research Lab, Armstrong Lab. NASA, NSF, NSA, and so on. In 1999 alone, several dozen international congresses were held on this subject.

49. When Jaron Lanier coined the term in 1989, it was also an attempt to combine diverse areas of research on the human-computer interface with different labels with utopian dreams in one, albeit paradoxical, catch phrase with a strong popular appeal.

50. On the concept of "virtual" in history and philosophy, see Wolfgang Welsch, "Virtual Anyway?" at 〈http:www.uni-jena.de/welsch/papers/virtual_anyway.htm〉.

51. The metaphor of the mirror, as used by Esposito, does not adequately express the phenomenon of the virtual, which can also comprise elements of the impossible (under natural law), the fantastic, and the awesome; see Esposito (1995, 1998).

52. Baudelaire (1899).

53. See Wulf Halbach, "Virtual Realities, Cyberspace und Öffentlichkeiten," pp. 168ff. in Krapp et al. (1997).

54. Lucian's art of description succeeded in getting images to appear before the inner eye of his listeners. In this connection, the section *De Domo* is exemplary, where the listeners were taken into a richly furnished hall; see Lucian (1913), pp. 176ff. In Schönberger's opinion, this effect also demonstrates the "real meaning of Philostratos' rhetoric ... to transport the observer to another sphere of existence by communicating to him the entire effect, the total impression, of the image." Schönberger (1995), p. 171.

55. See Recki (1991), p. 117.

56. Gosztonyi (1976), p. 959.

57. Gibson (1990).

58. Marcos Novak has given one of the most compact summaries of the vision of cyberspace:

Cyberspace is a completely spacialized visualization of all information processing systems, along pathworks provided by present and future communications networks, enabling full copresence and interaction of multiple users, allowing input and output from and to the full human sensorium, permitting simulations of real and virtual realities, remote data collection and control through telepresence, and total integration and intercommunication with a full range of intelligent products and environments in real space. Cyberspace involves a reversal of the current mode of interaction with computerized information. At present such information is external to us. The idea of cyberspace subverts that relation; we are now within information. In order to do so we ourselves must be reduced to bits, represented in the system, and in the process become information anew. Cyberspace offers the opportunity of maximizing the benefits of separating data, information, and form, a separation made possible by digital technology. By reducing selves, objects, and processes to the same underlying ground zero representation as binary streams, cyberspace permits us to uncover previously invisible relations simply by modifying the normal mapping from data to representation. (Marcos Novak, "Liquid architectures in cyberspace," in Benedikt 1991, p. 225)

59. Neumayer (1964), p. 13.

60. Ibid.

61. See Fisher and Watson (1988).

62. Welsch (1995).

63. On the dissolution of reality, see Vattimo (1998).

64. On the motif of landscapes, see Börsch-Supan (1967).