Metaverse's Modern Prehistory

Utopian Media from the Total Work of Art and Total Cinema to Cyberspace and Holodeck

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The Metaverse began its cultural career as an imagined digital medium in Neal Stephenson's *Snow Crash.*[1] The 1992 science fiction novel is set in the then near future, a dystopian Los Angeles in the 2010s, divided into war zones. The hero, tellingly named Hiro Protagonist, is a computer hacker who survives by delivering pizzas—for the mafia that has cornered the market. The living conditions in this future are anything but paradisiacal. People want to escape the daily grind. Hiro spends every free minute in the Metaverse, indulging above all in his love of sword fights.

Metaverse is a portmanteau of "meta," i.e., beyond, and "universe." Neal Stephenson uses it to describe a networked, computer-generated, persistent virtual 3D space centered around an enormous boulevard called "The Street," 100 meters wide and over 60,000 kilometers long. The description reads as if modeled on the Las Vegas Boulevard, particularly the section known as "The Strip." Users access the Metaverse via a high-performance Internet connection and 3D goggles. In its virtual realm, people find entertainment and work; they can exchange ideas, learn new skills, and play together. However, only a small minority of the planet's ten billion inhabitants are either wealthy or knowledgeable enough to enjoy and profit optimally from the Metaverse:

"In Stephenson's *Crash*, hackers who have the technical know-how to write their own code sport sophisticated, graphically complex on-line avatars, or three-dimensional personae, who interact in the virtual world. Japanese businessmen, on the other hand, order up minutely detailed, perfect images of themselves in the same dark suits they wear to the office.

1 Stephenson, Neal: *Snow Crash*, New York, NY: Bantam Books 1992.

Newbies coming in through cheap public terminals must make do with grainy, jerky black-and-white models."[2]

Nevertheless, in Stephenson's imagined world, the Metaverse is populated by over a hundred million people or, rather, their individualized avatars at any given time.

Neal Stephenson did not present his imaginary medium as a possible means to save or transform the future society into a paradise. Instead, he portrayed it as a questionable counter-world, an alternative space to escape a damaged reality that is hardly livable. Against all odds, what he described awakened utopian longings. Within months after the novel's publication, efforts commenced to use the imaginary medium as a model for artistic and commercial activity.

At present, the Metaverse has a three-decade history of reception, influence, and effect. Most of the contributions to this volume address the concept's presentness. However, Stephenson's invention also has a background history, both long and recent. Firstly, it is in the long modern tradition of imaginary—utopian or dystopian—media, starting with the ideal of the *Gesamtkunstwerk*, the Total Work of Art, and resulting in the mid-20th-century notion of a Total Cinema.

Secondly, the Metaverse is the third imaginary medium created in the early days of digital culture within a decade. Both pre-industrial and industrial technologies—along with new media such as perspective painting, letterpress printing, photography, film, and broadcasting—spurred speculation about improved or new forms of communication, art, and entertainment. Similarly, the invention of the computer and its networking since the 1950s has directly instigated visions about radically new possibilities in communication, art, and entertainment. In 1982, science fiction author William Gibson conceived "Cyberspace" as a virtual space for action and experience.[3] Five years later, screenwriter and TV producer Gene Roddenberry confronted the global audience of the science fiction series STAR TREK: THE NEXT GENERATION with the "Holodeck," a computer-controlled installation for interactive experiences on board the starship Enterprise-D. In 1992, Neal Stephenson finally imagined the "Metaverse," which forms the vanishing point of this investigation.

A key characteristic of all these blueprints for future media, from the Total Work of Art to the Metaverse, is that they did not remain theoretical speculations but also sparked practical desires for their realization among different audiences

2 Moukheiber, Zina: "The Geeks Have Inherited the Earth," *Forbes*, July 7, 1997, https://archive.org/stream/forbes160julforb/forbes160julforb_djvu.txt

3 Gibson, William: "Burning Chrome," *Omni* 4, no. 10 (July 1982), pp. 72-77, 102-107.

as well as artists and inventors. The Metaverse's unique significance for the present stems from it being the most recent vision of future media, gaining a vital artistic, cultural, technical, and commercial role model function.

In this introductory essay, I will trace the origins and effects of the most influential media utopias in Western modernity, leading to the conception of the Metaverse. Preparatory remarks on the relationship between imagining the future and media are followed by an overview of pre-digital modern media utopias. The concepts of a Total Work of Art and Total Cinema focused on improving the contemporary audiovisual media of stage and cinema, establishing a tradition in which digital imaginary media stand (*I From Analog to Digital Media Utopias*).

Next, I will discuss the two most potent visions of future digital media emerging before the Metaverse (*II Cyberspace, III Holodeck*). In each chapter, I first examine the origins of the concepts, then reconstruct their prehistory or, rather, background history encompassing their artistic-philosophical and technological foundations. Lastly, analyze their aftereffects, i.e., their cultural impact up to the present.

The concluding section (*Epilog: The Metaverse*) provides a brief overview of the antecedents and aftereffects of the Metaverse. The investigation then presents three fundamental results: firstly, that the historical state of technology and its social implementation have conditioned these three future visions of digital media; secondly, that they have an inherent dialectical relationship, which reveals Cyberspace as thesis, the Holodeck as antithesis, and the Metaverse as synthesis; and thirdly, that they envision a new type of reception that has since become commonplace—an immersive entry into media-based virtuality, as it is the principle of engaging with the Metaverse.

I FROM ANALOG TO DIGITAL MEDIA UTOPIAS

Speculation about the future permeates human culture.[4] Macro history teaches us that our species possesses the unique ability "to transmit information about things

4 The following paragraphs summarize historical processes that I have examined in more detail in: Freyermuth, Gundolf S.: "Utopian Futures. A Brief History of Their Conception and Representation in Modern Media—From Literature to Digital Games," in: Benjamin Beil/Gundolf S. Freyermuth/Hanns Christian Schmidt (eds.), *Playing Utopia: Futures in Digital Games*, Bielefeld: transcript 2019, pp. 9-65.

that do not exist at all."[5] Narratives of non-material entities connect us, welding us into ever larger groups. Jean-François Lyotard described this "intersubjective web of meaning"[6] that cultures spin to legitimize "imagined orders"[7] as a "grand narrative."[8] Ideas about the future are a constitutive element of such "grand narratives" or metanarratives. What Western humanity thought about a possible other—better or worse—life is the result of a series of cultural constructions that began in the Renaissance. We store these narratives of better or worse futures in a growing number of media.

1 Future Media

Before industrialization, utopias and then dystopias were primarily created in literature. With the emergence of the new genre of science fiction in the mid-19th century, the imagination became multi-medialized and trans-medialized: silent and sound films as a medium for future narratives were joined in the first half of the 20th century by radio and comics, and in mid-century by television and, in the final decades, digital games. The history of possible futures is, therefore, a media history.

What all media evocations of future forms of life—both desirable and undesirable—seem to have in common is that they are rooted in their respective time even more than other artistic works and are limited by it. From a historical distance, visions of the future reveal the circumstances of their creation impressively: specific contemporary concerns, typical longings and fears, morals, and prejudices of their era. "[U]topia is a mirror to the present designed to bring out flaws, a circus or funfair mirror in reverse, to illustrate ways in which life could be better."[9]

5 Harari, Yuval N.: *Sapiens: A Brief History of Humankind*, New York, NY: Harper, Kindle Edition 2015, p. 24.

6 Harari, Yuval N.: *Homo Deus: A Brief History of Tomorrow*, New York, NY: Harper, Kindle Edition 2017, p. 144 ff.

7 Ibid.

8 Lyotard, Jean-François: *The Postmodern Condition: A Report on Knowledge*, Minneapolis, MN: University of Minnesota Press 1984 [*1979].

9 Sargent, Lyman Tower: *Utopianism: A Very Short Introduction*, Oxford: Oxford University Press 2010, p. 112. See also: "Utopias are reflections of the issues that were important to the period in which their authors lived," (ibid., p. 21). Likewise: "Visions of the future express the ethos of their times" (Heilbroner, Robert L.: *Visions of the Future: The Distant Past, Yesterday, Today, Tomorrow*, New York, NY: Oxford University Press 1995, loc. 1,240).

Questions of individual freedom and social organization, particularly changes in work, education, medicine, or transport, are of increased interest.

Another crucial aspect of conceptualizing the future in the modern era is the imagination of futuristic modes of communication and storytelling. For centuries, such "media prophecies"[10] have been driving the theoretical conception and artistic realization of new effects and media, from the theatrical utopia of the Total Work of Art to visions of a future cinema such as the *feelies* from Aldous Huxley's *Brave New World*[11] or André Bazin's "Le Mythe du Cinéma Total"[12] to postmodern art utopias such as Gene Youngblood's *Expanded Cinema*[13] and Roy Ascott's telematic "Gesamtdatenwerk."[14]

"Media history teaches us," write Christoph Ernst and Jens Schröter, "that future media, as imaginary objects, themselves fulfill a mediating function: future media are generated as epistemic objects, and this process is reflected methodically in order to bring together the heterogenous interests of different actors."[15] These actors include, not least, the technological avant-gardes. By conveying expectations about the direction of research and technology, visions of future media not only stimulate their imagination. They shape technological and aesthetic practice as a model by, as Michael Friedewald states, "steering the individual perception and the value system of the actors involved in the production of technical knowledge in a common direction."[16]

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10 Natale, Simone/Balbi, Gabriele: "Media and the Imaginary in History," *Media History* 20, no. 2 (2014), pp. 203-218, here p. 205, https://www.tandfonline.com/doi/abs/10.1080/13688804.2014.898904

11 Huxley, Aldous: *Brave New World*, New York, NY; Evanston, IL: Harper & Row 1946 [*1932].—Huxley's vision of the future of cinema was dystopian. The re-evaluation into a utopia to be pursued is not an isolated case; the current reception of the Metaverse is another example.

12 Bazin, André: "The Myth of Total Cinema," in: *What Is Cinema?*, Berkeley, CA: University of California Press, 1967-1971 [*1946], pp. 23-27.

13 Youngblood, Gene: *Expanded Cinema*, New York, NY: Dutton 1970.

14 Ascott, Roy: "Gesamtdatenwerk. Connectivity, Transformation and Transcendence [*1989]," in: Timothey Druckey (ed.), *Ars Electronica: Facing the Future*, Boston, MA: MIT Press 1999; online: http://epc.buffalo.edu/584/docs/ascott.html, pp. 86-89.

15 Ernst, Christoph/Schröter, Jens: *Media Futures: Theory and Aesthetics*, Cham: Springer Nature 2021, p. 11.

16 Friedewald, Michael: *Der Computer als Werkzeug und Medium: Die geistigen und technischen Wurzeln des Personal Computers*, Berlin: GNT-Verlag 1999, p. 23. (My translation.)

Since at least the Enlightenment, aesthetic reflection has recognized that experimental anticipations of the future—both in technologies and forms of expression—can be achieved through artistic production.[17] Artists have consistently worked towards effects and reception experiences that deviate from the familiar and, at the same time, remind us, as if from afar, of the sensations of media that would only emerge later. In the modern era, these anticipatory visions have centered on the most culturally influential audiovisual media. From the 16th century onwards, aspirations focused on enhancing and transcending the stage—what Friedrich Schiller called "the boards that mean the world."[18] In the first third of the 20th century, attention shifted to improving and overcoming analog film, the first medium that, as Siegfried Kracauer recognized, was capable of redeeming physical reality.[19] Finally, since the last two decades of the 20th century, visions have focused on the future powers of digital audiovisuals.

2 Theater: The Total Work of Art

In the Christian Middle Ages, stages were like boxing rings. They were free of scenery and visible from all sides, so they did not create their own illusionary space separate from the real world. The Shakespeare stage of the 16th century also allowed views from three sides and thus offered the audience quite freely selectable perspectives, comparable to pedestrians who follow events on nearby properties and buildings as they walk by. It was not until the Baroque period that efforts were made to control the perception of the playful events in a way that enhanced the illusion, in particular by categorically separating audiovisual fiction from reality.

The arrangement in the new theater buildings integrated two contemporary models: perspective painting and popular peep-box entertainment with its partly painted and partly modeled art worlds. The auditorium positioned the audience in front of a rectangular, framed opening closed by a curtain. When the performance

17 On the history and theory of aesthetic anticipation, see chapter *III Problems of Prophecy and Theories of Anticipation* in: G. S. Freyermuth: "Utopian Futures," here pp. 18-22.

18 Schiller, Friedrich: "An die Freunde," *Literaturwelt*, 1803, http://www.literaturwelt.com/werke/schiller/an-die-freunde.html.—The common English two-line translation "Yet we see the great of every age / Pass before us on the world's wide stage" does not capture the meaning of the three-line original: "Let us see the great of all times / On the boards that mean the world, / Pass us by in meaningful silence." (My translation.)

19 Kracauer, Siegfried: *Theory of Film: The Redemption of Physical Reality*, New York, NY: Oxford University Press 1960.

began, perspective-controlled views of a play in naturalistic settings opened up. Their arrangement simulated spatial depth. This effect was often reinforced by painted buildings or landscapes in the central perspective vanishing point. The aesthetic experience offered by the peep-box stage was based on the illusion that, once the curtain had been raised, one could observe events in a distant reality separate from one's own, i.e., from a completely safe distance, as if through a window or the missing fourth wall of a room.

The innovative achievement of the new stage form—the ontological separation of audiovisual spectacles from the audience's space and the effort to create lifelike counter-worlds employing mechanical imitation—also defined its weakness. The window view made it impossible to participate or even intervene. The viewers remained physically and, therefore, often psychologically uninvolved to a certain degree. This reduction of the experience of alternative visual and audiovisual realities immediately aroused compensatory longings. Right into the early days of industrialization, perspective boxes and cabinets of curiosities, panoramas, dioramas, and phantasmagorias experimented with deconstructing and overcoming the separation between the visual and audiovisual play and its audience.[20]

The high-cultural ideal of higher immersion became the *Gesamtkunstwerk*. It was to transcend the limitations of contemporary stage drama—tragedy, comedy, singspiel, and opera—by combining all existing arts into lifelike realism and increased immersion. The first, as Alfred Robert Neumann wrote, "clear-cut definition of a *Gesamtkunstwerk*" was formulated by Johann Mattheson in 1744:

"In my few opinions, a good opera theater is nothing other than a high school of many beautiful sciences, in which architecture, perspective, painting, mechanics, dance, *actio oratoria,* morality, history, poetry, and above all music, are united in the most pleasant way for the amusement and edification of distinguished and sensible spectators, and always give new samples."[21]

20 See Bredekamp, Horst: *The Lure of Antiquity and the Cult of the Machine: The Kunstkammer and the Evolution of Nature, Art, And Technology*, Princeton, NJ: M. Wiener Publishers 1995; Oettermann, Stephan: *The Panorama: History of a Mass Medium*, New York, NY: Zone Books 1997.

21 Johann Mattheson: *Neueste Untersuchung der Singspiele* (1744), quoted from Neumann, Alfred Robert: *The Evolution of the Concept Gesamtkunstwerk in German Romanticism*: Microfilm. Ann Arbor, MI, University Microfilms 1951, p. 12. (My translation.)

Wilhelm Heinse, Christoph Willibald Gluck, Johann Gottfried von Herder, and Gotthold Ephraim Lessing, among others, subsequently argued in favor of the *Gesamtkunstwerk*. Lessing's 1766 programmatic work *Laocoon: An Essay Upon the Limits of Painting and Poetry*, for instance, hoped to improve the mechanical arts and their realistic imitation through amalgamation.[22] In retrospect, the epochal aspiration to integrate all the arts was clearly a compensatory reaction to industrialization and the accompanying proliferation of the division of labor. Adam Smith analyzed it in 1776 as the source of all *wealth of nations.*[23] The change seemed painfully 'unnatural' to many of those who had to perform these increasingly fragmented work processes. "Simultaneously with the specialist there awoke the desire to encompass all life into a single work of art, a symbol of all endeavors."[24]

Around 1800, the demand for the *Gesamtkunstwerk*—based on the desire to combine audiovisual play in perspective-realistic settings so harmoniously and immersively that the boundary between art and life merged—penetrated almost all areas of Romantic art production. "The time was charged with the urge for a new art form."[25] Novalis, for example, sought to achieve synesthetic overall effects in novels, Philipp Otto Runge in painting, Carl Maria von Weber in opera, E.T.A. Hoffmann as a "Gesamtkuenstler" in music and literature.[26]

The long-desired "art-work of the future"[27] was finally theoretically conceived by Richard Wagner and, after 1876, brought to the Bayreuth illusion stage, which was powered by steam and also otherwise characterized by industrial technology:

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22 Lessing, Gotthold Ephraim/Frothingham, Ellen: *Laocoon. An Essay Upon the Limits of Painting and Poetry*, Boston, MA: Roberts Brothers 1874 [1766].—Neumann describes Lessing's remark as "the inception of an organized theory of the *Gesamtkunstwerk* on the part of a German author" (ibid., p. 16.).

23 Smith, Adam: *An Inquiry into the Nature and Causes of the Wealth of Nations*, Amsterdam et al.: MetaLibri 2007 [*1776], https://www.ibiblio.org/ml/libri/s/SmithA_WealthNations_p.pdf

24 A. R. Neumann: *The Evolution of the Concept Gesamtkunstwerk*, p. 6.—Similarly, Benjamin recognized in the concept primarily the attempt to "seal art off from the developments of technology" (Benjamin, Walter: "Paris, the Capital of the Nineteenth Century [Exposé of 1935]," in: *The Arcades Project*, Cambridge, MA: Belknap Press of Harvard University Press 2002, pp. 3-13, here p. 11.)

25 A. R. Neumann: *The Evolution of the Concept Gesamtkunstwerk*, p. 120.

26 See Ibid., p. 11.

27 Wagner, Richard: "The Art-Work of the Future," in: *The Art-Work of the Future, and Other Works*, Lincoln, NE; London: University of Nebraska Press 1993 [*1850], pp. 69-213.

as a "great United Art-work, which must gather up each branch of art to use it as a mean, and in some sense to undo it for the common aim of all, for the unconditioned, absolute portrayal of perfected human nature."[28] This was to be achieved through absolute aesthetic control of the work and its experience. Wagner not only wrote the texts and composed the music, but he also designed the specially built theater and its stage, determined the scenery, and decided on the use of innovative musical instruments, for example, the so-called Wagner tuba. By making the orchestra disappear, illuminating the stage strongly and soon electrically, and darkening the auditorium, he radically broke with theatrical tradition and anticipated elements of the dream-like experience that the cinema would offer a few decades later.

Wagner's operas, along with their staging, represented a significant departure from pre-industrial arts. They aimed for a new multimedia unity. The Bayreuth "Festspielhaus" thus appears as ground zero of the "Gesamtkunstwerk." In retrospect, it also foreshadows the cinematic dream factories that would only emerge in the 20th century.

3 After Theater: Total Cinema

The acceleration of social change, marked by the occurrence of almost simultaneous technological, economic, and political revolutions, intensified in the late 19th century the demand for realistic and potentially moving images that would represent the new industrial and metropolitan way of life. At the turn of the 20th century, decades of technical and artistic experimentation culminated in film. Its first incarnation—silent and black and white—did not yet correspond to the ideal of the audiovisual *Gesamtkunstwerk*. In this respect, the utopian model continued to have a cultural impact on the theater as well as modern art and architecture, including the Bauhaus movement, whose most prominent protagonists integrated elements of architecture, painting, and sculpture in their designs and works to create a holistic effect.[29]

After 1930, the photorealism of silent film was enhanced by the addition of sound and then color. While for many theorists and practitioners, the new audiovisual medium seemed "complete" and its evolution finished, others longed for—

28 Ibid., p. 88.—"Great United Art-work" is the 1895 translation of *Gesamtkunstwerk*.

29 Martin, Naomi: "Gesamtkunstwerk—The Total Work Of Art Through The Ages," *Artland Magazine*, https://magazine.artland.com/gesamtkunstwerk-the-total-work-of-art-through-the-ages/

or feared—more. Initially, the vision of a narrative form improved by multisensory participation was expressed as a dystopia: In his *Brave New World*, Aldous Huxley, writing in the early days of the sound film, described the evolution of cinema—of movies or talkies—into more immersive *feelies*. These imagined multimedia narratives employed haptic and olfactory sensory stimuli in addition to moving images and sound. They enveloped the individual immersed in the pneumatic armchair and shaken by the joystick in three dimensions: "all-Super-Singing, Synthetic-Talking, Coloured, Stereoscopic Feely. With Synchronized Scent-Organ Accompaniment."[30]

Huxley did not conceive of the new medium as a program to be pursued but as an aberration to be prevented—not as an advanced experience of art but as its destruction. In the novel, the *feelies* initiate a memoryless dozing off in a media mirage, "far more real than reality."[31] In contrast to bourgeois art, the *feelies* do not enlighten about reality but feign sensual experience to such an extent that, in the end, real kisses pale before those felt in the imaginary medium. In Huxley's rejection of the *feelies*, it is easy to see his more fundamental aversion to the "technological paradise of California."[32] As the next stage of the *talkies,* the *feelies* stand for the enslaving control that, in Huxley's eyes, Hollywood's synthetic dreams exercised over humanity.

A decade later, André Bazin discussed quite positively the upgrading of cinema and its overcoming as a purely audiovisual medium, which Huxley had feared. The French film theorist noted the widespread desire for a Total Cinema: "the reconstruction of a perfect illusion of the outside world in sound, color, and relief"[33] and the "recreation of the world in its own image."[34] It was not only the

30 A. Huxley: *Brave New World*, pp. 199-200. See Hüningen, James about: "Feelies," *Das Lexikon der Filmbegriffe*, March 29, 2022, https://filmlexikon.uni-kiel.de/doku.php/f:feelies-2278.—The reevaluation of the concept of a more immersive cinema, especially during the 1950s, into something utopian to be pursued is not an isolated case in media history. The current reception of Neal Stephenson's Metaverse is another example of such a change.

31 A. Huxley: *Brave New World*, p. 200.

32 See Kumar, Krishan: "Utopia and Technology in the Twentieth Century," *Swiss Review of World Affairs*, March 1993. Kumar refers, among others, to Huxley, Aldous: "The Outlook for American Culture: Some Reflections in a Machine Age," *Harper's Magazine*, August 1927.

33 A. Bazin: "The Myth of Total Cinema," p. 20.

34 Ibid., pp. 21-22.

description of the future of film that was reminiscent of Richard Wagner's evocation of the "work of art of the future." The term Bazin chose—"cinéma total"—referred directly to "Œuvre d'art totale," the French translation of Total Work of Art. Almost simultaneously, experiments to increase the intensity of cinematic narratives began worldwide. The proto-Total Cinema of the 1950s employed analog electronics for this purpose. Ever wider and more colorful images, stereo, and high-fidelity sound, as well as analog 3D images, assaulted the senses—not least to counter the competition from television, whose black and white small screens and squawking loudspeakers were beginning to marginalize cinema.

4 After Cinema: Transmedia

In the early days of digitization—before digital film cameras and digital projection or even photorealistic-looking moving images in digital games existed—Vilém Flusser remarked that the new technology was giving rise to a "new imagination." It is capable of creating radically different imagery in place of the analog images of the world produced by cameras:

"The old pictures are tables of orientation within the world: they point at the world [...]. The new ones are projections of calculating thought: they point at thought [...]. For example: a synthetic picture of an aeroplane does not show a 'real,' but a possible aeroplane. It is the representation of a 'thought' plane."[35]

The origin of the production of such mental images—moving images that could not be photographed but only calculated—dates back to the 1960s. In American laboratories, the generation of simple animations commenced, mostly visualizations of scientific concepts or demonstrations of the processes and possibilities of virtual image production. These experiments inspired the film theorist Gene Youngblood to propose the future media of Expanded Cinema or "cybernetic cinema."[36] Youngblood was one of the first to understand the computer as an "aesthetic machine," as an artistic tool to overcome the photorealism of the camera:

"The notion of 'reality' will be utterly and finally obscured [...] There'll be no need for 'movies' to be made on location since any conceivable scene will be generated in totally convincing reality within the information processing system. By that time, of course, movies

35 Flusser, Vilém: "A New Imagination," *Artforum* 26 (April 1988), pp. 14-15, https://s3.amazonaws.com/arena-attachments/151305/a67bb387e1a69ab010c1b4aaa08918c4.pdf

36 G. Youngblood: *Expanded Cinema*.

as we know them will not exist. We're entering a mythic age of electronic realities that exist only on a metaphysical plane."[37]

As early as the 1970s, film historian Robert Sklar also emphasized the foreseeable end of analog film and the emergence of a new moving image production whose practices even utopian concepts such as Expanded Cinema could barely imagine:

"We stand in the last quarter of the twentieth century in a position similar to the men and women in the last quarter of the nineteenth century who sought the intellectual, emotional and technological means to alter their ways of seeing the world, and in the process created a new medium. The computer, videographic and holographic films of the early 1970s may no more resemble the cinema of the future than Muybridge's row of separate still cameras [...] related, except in principle, to the motion-picture technologies that followed."[38]

Parallel to theoretical reflections on future audiovisuals, the longing for a more unrestrained design of moving images was expressed in practical attempts to digitally produce mental images in Flusser's sense: effects that could not be arranged 'realistically' in front of a camera lens. In 1973, Michael Crichton employed 2D computer animation for the first time in a major Hollywood production, WESTWORLD.[39] For his 1976 film FUTUREWORLD, Richard T. Heffron utilized computing power to let Peter Fonda's face rotate three-dimensionally in the air.[40] The post-production of STAR WARS also involved minor digital image corrections subsequent to the first use of computers to control cameras and models during the filming process.[41]

The most advanced contemporary example of a hybrid production was Disney's TRON in the same year the word Cyberspace first appeared in print. Around 230 scenes, a total of 15 minutes of the production, which was at 20 million dollars quite expensive for the early 1980s, were digitally animated.[42] TRON transformed

37 Ibid., p. 206.

38 Sklar, Robert: *Movie-Made America: A Cultural History of American Movies*, New York, NY: Vintage Books 1976, p. 315.

39 WESTWORLD (USA 1973, D: Crichton, Michael).

40 FUTUREWORLD (USA 1976, D: Heffron, Richard T.).

41 STAR WARS: A NEW HOPE (USA 1977, D: Lucas, George). For example, the destruction of the Death Star was digitally enhanced.

42 TRON (USA 1982, D: Lisberger, Steven). See McEachern, Martin: "Tron 2.0: Twenty Years Later, Tron Re-emerges as an Interactive Experience with Souped-Up Graphics," *Computer Graphics World* 26, no. 7 (July 1, 2003).

the inability to produce lifelike visuals into a thematic opportunity: the hacker hero is abducted into the interior of a computer. Therefore, central scenes did not have to be photorealistic to appear realistic but could be modeled on contemporary low-res computer graphics.

A comparable option was not open to George Lucas. His STAR WARS saga was set in the 'reality' of a fantastic future. With analog means or the rudimentary digital technology available to him in the early 1980s, he could not realize the scenes that he—in Flusser's words—had mentally calculated. Lucas himself once compared the limitations he faced to a painter's lack of colors: "With STAR WARS, we were basically off the color palette. [...] The only way you get there is to create technology that will bring those colors into the realm of what's achievable [...]."[43] After RETURN OF THE JEDI, Lucas stopped the saga.[44] He only aspired to produce further STAR WARS films once he had achieved his vision of hyperrealistic cinema.

For nearly two decades, he had his special effects company, *Industrial Light & Magic*, research and develop the necessary digital hardware and software. This endeavor resulted, at the turn of the 21st century, in the first digital film master and the first digital film projection (both THE PHANTOM MENACE[45]) as well as the first major Hollywood production to be filmed entirely with digital cameras (ATTACK OF THE CLONES[46]).

By this time, the film industry, mainly under Lucas' leadership, had long since produced an entirely new, partly analog, partly digital version of the concept of the *Gesamtkunstwerk*: transmedia narratives that, like STARS WARS, STAR TREK, or THE MATRIX, encompassed a multitude of films and television series, but also novels, analog and digital games, and every conceivable form of merchandise. In his analysis of the transmedia universe of The MATRIX in 2004, William G. Doty first observed its proximity to the dominant media utopia of the modern era:

"[T]o stage so extensive and complex an artistic and commercial production can be compared to what Richard Wagner attempted in his German opera house: he sought to produce a *Gesamtkunstwerk*, a total, all-encompassing, and synthesizing work of art that would provide nationalistic ideals."[47]

43 Quoted from Vaz, Mark Cotta/ Duignan, Patricia Rose: *Industrial Light & Magic: Into the Digital Realm*, New York, NY: Ballantine Books 1996, p. 108.

44 RETURN OF THE JEDI (USA 1983, D: Marquand, Richard).

45 STAR WARS: EPISODE I—THE PHANTOM MENACE (USA 1999, D: Lucas, George).

46 STAR WARS: EPISODE II—ATTACK OF THE CLONES (USA 2002, D: Lucas, George).

47 Doty, William G.: "Introduction: The Deeper We Go, the More Complex and Sophisticated the Franchise Seems, and the Dizzier We Feel," in: William G. Doty/Matthew

A year later, John Shelton Lawrence used the same analogy for George Lucas' latest installment of the STAR WARS saga: "Seen against history's tapestry of grand creations, Lucas has woven himself in alongside Richard Wagner [...] Echoing Wagner's conception of his art as *Gesamtkunstwerk*—a totally encompassing, technologically refined blend of image and sound."[48] However, he referred to the complicated production of individual scenes, characterized by a high degree of aesthetic control. Finally, in 2010, Matthew Wilhelm Kapell posited that the transmedial construction of modern myths revealed their proximity to the media utopian ideal: "franchises, where the creators and producers of the art—such as in THE MATRIX and STAR WARS—develop a kind of contemporary *Gesamtkunstwerk*."[49]

5 Into the Digital Realm

Despite their differences, the pre-digital visions of imaginary audiovisual media—from the 18th- and 19th-century visions of a Gesamtkunstwerk for the stage to the film fantasies of the 20th century, including Huxley's *feelies*, Bazin's Total Cinema, and Youngblood's Expanded Cinema—share one commonality: They aim to transcend the conventional window view experiences of theater, film, and television. All of these visions aspire to a heightened degree of immersion and participation, a complete immersion in the fictional world. However, such desires remained largely unfulfilled as long as audio visions had to be produced in the analog realm.[50] In the physical world, a safe experience of dangerous actions requires

Kapell (eds.), *Jacking In To the Matrix Franchise: Cultural Reception and Interpretation*, New York, NY: Bloomsbury 2004, pp. 1-12.

48 Lawrence, John Shelton: "Introduction: Spectacle, Merchandise, and Influence," in: Matthew Kapell/Lawrence, John Shelton (eds.), *Finding the Force of the Star Wars Franchise: Fans, Merchandise, & Critics*, New York, NY: P. Lang 2006, pp. 1-20, here p. 3.

49 Kapell, Matthew: "Introduction: The Significance of the Star Trek Mythos," in: Matthew Kapell (ed.), *Star Trek as Myth: Essays on Symbol and Archetype at the Final Frontier*, Jefferson, NC: McFarland & Co. 2010, pp. 1-16, here p. 2.

50 See Freyermuth, Gundolf S.: "Vegas, Disney, and the Metaverse: On the Material Anticipation of Virtual Worlds and Virtual Play in the Second Half of the 20th Century," in: Benjamin Beil/Gundolf S. Freyermuth/Hanns Christian Schmidt/Raven Rusch (eds.), *Playful Materialities: The Stuff That Games Are Made Of*, Bielefeld: transcript 2022, pp. 17-97.

their separation from everyday life. Performances must be confined to heterotopic "magic circles" as soon as they deviate from business-as-usual actions.

In contrast to the theater, analog cinema offered its audience a sense of ontological distance and security, as it only projected shadow images of past performances. However, entering these fictions or interacting with their characters was categorically excluded. The digitalization of cinema—a techno-aesthetic utopia put into practice during the second half of the 20th century—successively provided the necessary media technology to calculate mentally designed images and scenes. Nevertheless, as long as these audiovisions had to be pre-produced, it was not possible to achieve interactive immersion. William Gibson's Cyberspace, on the other hand, envisions the real-time production of calculated mental images.

II CYBERSPACE

It is challenging to ascertain how many computers existed globally around 1980. Older literature suggests that several million computers were already in operation. However, the majority were large and expensive devices such as mainframes and so-called "minicomputers," which only institutions and larger companies could afford.[51] The 1980s saw the breakthrough of the Personal Computer. The number of these smaller and more affordable devices, crucial for understanding the social implementation of digital technology, is placed by one source at only two million in the early 1980s and 50 million, with significantly enhanced computing capabilities around 1990.[52] Another source estimates that 65 million PCs were in use by the decade's end.[53] With the PC, digital technology made its way from the secluded departments of large industrial institutions—military and civilian research,

51 Campbell-Kelly and Aspray speak of around 150,000 mini and microcomputers and 75 million microchips sold in the mid-1970s, which were installed not only in PCs but also in other devices, including calculators, game consoles, and medical equipment (Campbell-Kelly/Aspray, Martin/Aspray, William: *Computer: A History of the Information Machine*, New York, NY: Basic Books 1996, p. 229). Friedewald also mentions 165,000 mainframe computers in the USA alone (M. Friedewald: *Computer*, p. 16).

52 Lilly, Christopher LaMorte with John, "Computers: History and Development," (Jones Telecommunications and Multimedia Encyclopedia), http://www.digitalcentury.com/encyclo/update/comp_hd.html

53 HistoryTools: "The Personal Computer Revolution: A Timeline of Innovation and Impact," accessed June 15, 2024, https://www.historytools.org/docs/computer-history-timeline-personal-computers-computing-internet

national and corporate administrations—into the everyday working lives of developed Western countries and, in some cases, into private offices and homes.

PCs owed their success on the one hand to productivity software such as spreadsheets, databases, and word processing, and on the other to digital games, which were primarily text-based and, at best, featured simple graphics.[54] For the minority of people in developed countries who already owned PCs, the experience of computing underwent a profound transformation. What had been a large-scale industrial technology designed to control, if not suppress, individual interests mutated into an individualized work and information device. It empowered individuals, small groups, and small companies to compete with institutions and corporations. In 1982, the magazine *Time,* therefore, declared the personal computer "Machine of the Year" instead of the usual "Person of the Year."[55] In 1984, Apple released the Macintosh, the first PC to feature a graphical user interface (GUI). Its simplified use caught on quickly, prompting Microsoft to follow suit with the Windows operating system.

At the same time, digital networking developed, starting in the USA. Its concept—which initially seemed utopian—goes back to J.C. R. Licklider. In 1960, he proposed replacing the then-common institutional use of computers, which only granted access to a few experts, with individual and interactive access for everyone who wanted to use computing power. He thus introduced the idea of the personal computer to the world. Three years later, Licklider developed the complementary concept of networking individual computers under the spectacular slogan of an "Intergalactic Computer Network."[56] Its basis seemed to him a digital infrastructure independent of the analog telephone network. As director of a critical ARPA department, he initiated the research to establish the first "experimental

54 See M. Campbell-Kelly/W. Aspray: *Computer*, p. 249.

55 See McCracken, Harry: "Time's Machine of the Year, 30 Years Later," *Time*, January 4, 2013, https://techland.time.com/2013/01/04/times-machine-of-the-year-30-years-later/.—Although the first woman received this award in 1936, *Time* only changed the category to "person of the year" in 1999.

56 See Friedewald, Michael: "Konzepte der Mensch-Computer-Kommunikation in den 1960er Jahren: J. C. R. Licklider, Douglas Engelbart und der Computer als Intelligenzverstärker," *Technikgeschichte* 67, no. 1 (March 2000), pp. 1-24, http://www.friedewald-family.de/Publikationen/TG012000.pdf

network of multi-access computers." In 1969, the Arpanet connected the first three large computers.[57]

Analog long-distance communication is distinguished by physical circuit switching. The advent of digital networking established a new fundamental technology: *packet switching,* a method of self-control of the flowing data packets conceived by Leonard Kleinrock in 1959 and still in use today.[58] At the beginning of the 1980s, around 200 mainframes in the Arpanet enabled digital communication. By the decade's end, this number had grown to almost 160,000 computers. In addition to the Arpanet, there were several other, albeit smaller, national networks in the USA—e.g., the National Science Foundation's CSNet and Usenet, an early form of social media founded in 1980—as well as around 40,000 bulletin board systems (BBS), accessible to everyone via local telephone dial-up. All these networks were largely incompatible with each other.

In 1983—based on Arpanet's TCP/IP protocol—an "internetworking" protocol was established that allowed all these networks to be connected. This transition to the Internet created a virtual "data space" in which it was potentially possible to communicate and trade globally via constantly flowing data streams. However, until the end of the 1980s, access was limited to a tiny minority. Computer scientists, engineers, military personnel, scholars, and students could communicate online if they worked in the United States, on US military bases, in US embassies, or in academic institutions in Canada, Australia, and Europe affiliated with ARPA. Insofar as the use was professionally oriented, there were hardly any entertainment offerings. Nevertheless, the 1970s and early 1980s saw the development of the first networked digital games, initially playable within mainframe computers and later via the Internet, for example, MUD1[59] and MAZE WAR.[60]

57 ARPA stands for the Advanced Research Projects Agency of the US Department of Defense. See Licklider, J. C. R./Taylor, Robert W.: "The Computer as a Communication Device," *Science and Technology* 76, (1968), pp. 21-40, http://www.memex.org/licklider.pdf—For the following see Leiner, Barry M., Vinton G. Cerf, David D. Clark et al., "A Brief History of the Internet," *Internet Society,* 1997, https://www.internetsociety.org/wp-content/uploads/2017/09/ISOC-History-of-the-Internet_1997.pdf

58 Kleinrock, Leonard: *Communication Nets; Stochastic Message Flow and Delay*, New York, NY: McGraw-Hill 1964.

59 MUD (University of Essex 1978, O: Roy Trubshaw, Richard Bartle). The first multiuser dungeon could be played on the Arpanet starting in 1980.

60 MAZE WAR (NASA Ames Research Center 1974, O: Steve Colley, Greg Thompson, and Howard Palmer). The local multiplayer game became available on the Internet in 1986.

1 *Chrome & Neuromancer*

William Gibson's short story "Burning Chrome" responded to this early stage of digital networking: Two hackers attempt to steal from a criminal organization called Chrome by manipulating data streams.[61] When Gibson tried to name the networked action space in which his protagonists operated in 1981, he originally chose "Infospace." However, he deleted the word and replaced it with "Dataspace." This term did not last either. Ultimately, Gibson coined an entirely new term: "Cyberspace."[62] The prefix "cyber" is derived from the Greek word "kubernao" (to steer a ship) and can be found not only in cybernetics—the science of control processes—but also in terms such as governor or government. In this respect, cyber connotes sovereign control when navigating the realm of digital data, which is not without danger.

Two years later, now in the age of the Internet, William Gibson detailed what made Cyberspace unique in his novel *Neuromancer*. There, he described this new domain of virtual communication and action as a

> "consensual hallucination experienced daily by billions of legitimate operators, in every nation [...] A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding."[63]

The heroes of Cyberspace are "hackers."[64] The term appeared in the 1960s in research institutions at the Massachusetts Institute of Technology (MIT) and Stanford University. It referred to ingenious electronic tinkerers. A "hack" was the most elegant solution to a challenging hardware or software problem. Around the mid-seventies, these "Heroes of the Computer Revolution," as Steven Levy called them, developed the first affordable personal computers.[65] By exploring and exploiting the potential of the new technology in the early days of digitalization,

61 W. Gibson: "Burning Chrome."

62 See Z. Moukheiber: "The Geeks Have Inherited the Earth."

63 Gibson, William: *Neuromancer*, New York, NY: Ace Books 1984, p. 6.

64 On the history of hackers see Hafner, Katie/ Markoff, John: *Cyberpunk: Outlaws and Hackers on the Computer Frontier*, New York, NY: Simon & Schuster 1991; Himanen, Pekka: *The Hacker Ethic, and the Spirit of the New Economy*, New York, NY: Random House 2001; Levy, Steven: *Hackers: Heroes of the Computer Revolution*, New York, NY: Dell 1985 [*1984].

65 S. Levy: *Hackers*.

hackers operated as the "vanguard of a daring symbiosis between man and machine."[66]

However, *Neuromancer*'s hacker protagonist, Henry Case, is a failure and an outcast. He once effortlessly merged with his Cyberspace deck "that projected his disembodied consciousness into the consensual hallucination that was the matrix."[67] Cyberspace afforded him a dislocated existence untethered from the constraints of the physical world and expanded his consciousness. At the same time, Case experienced Cyberspace as an arena of virtual battles between powerful opponents—corporations, artificial intelligences, and, of course, other hackers. But then the successful "console cowboy" stole from his employer. The punishment followed swiftly: profound damage to his nervous system. It prevents the necessary symbiosis with his Cyberspace deck. Exiled into reality, Case lives as a "prisoner of his flesh,"[68] a state of re-embodiment that he wants to undo at all costs. He longs to free himself again from "all of the meat and all that it wants."[69]

Neuromancer received both the Hugo and Nebula awards and, with its critical and popular success, provided the style-defining literary prototype for a new subgenre, cyberpunk.[70] Bruce Bethke coined the term with his science fiction story of the same name a year after "Burning Chrome."[71] The title merged high-tech cybernetics with low-life punk, i.e., advanced technology with a revolting counterculture. *Neuromancer* established two constitutive elements of cyberpunk: firstly, its hero, Henry Case, like so many later characters, lives in a dystopian high-tech future characterized by oppression and social conflict. A quarter of a century ago, I described it like this:

"The standard scenario of cyberpunk narratives occurs sometime in the twenty-first century. Huge corporations have divided the world into business zones. Masses of petty-bourgeois data slaves and a violent underclass of drug-addicted zombies populate the simultaneously sprawling and decaying urban landscapes. These slums of concrete and bare steel girders

66 Ibid., p. 86.

67 W. Gibson: *Neuromancer*.

68 Ibid.

69 Ibid., p. 9.

70 On cyberpunk literature see Cavallaro, Dani: *Cyberpunk and Cyberculture: Science Fiction and the Work of William Gibson*, London; New Brunswick, NJ; Somerset NJ: Athlone Press; Distributed in the United States by Transaction Publishers 2000.

71 See Bethke, Bruce: "Cyberpunk, Foreword," *Infinity Plus*, 2002 [*1997], http://www.infinityplus.co.uk/stories/cpunk.htm

contrast with the palaces of marble and brass in which the corporations reside. In this cyberpunk future, the individual—already 'a terminal of multiple networks' in the words of Jean Baudrillard—has become just a data transit station, an appendage of the machines. The latter is to be understood quite literally: the heroes of these novels, data guerrillas and console cowboys, cunning loners, and lone warriors can plug themselves directly into the matrix thanks to brain implants and skull plugs."[72]

Secondly, Cyberspace is ambivalently characterized. At a time when computers could only communicate by numbers and letters, Gibson transformed the world of virtual data into an audiovisual geography: "Cyberspace is created by transforming a data matrix into a landscape in which narratives can happen."[73] On the one hand, Gibson's Cyberspace promises an escape from reality, i.e., freedom and amusement. At the same time, however, it threatens enslavement and exploitation. Just accessing is expensive. Those who want to live in the digital networks must earn this experience—one way or the other. Even more problematic is that action in virtuality requires bio-drugs or high-tech implants. Independent modes of perception, as well as a traditional human existence, are called into question. Bruce Sterling speaks of a "mind invasion": "Brain-computer interfaces, artificial intelligence, neurochemical techniques that radically redefine human nature, the nature of the self."[74] Quite obviously, the cyberpunk genre reacted to the parallel popularization of the transhumanist vision of our species' technological self-evolution.

Despite the novelty of its worlds and characters, cyberpunk fits into the contemporary mainstream of science-fiction—thanks to its technology-critical and fundamentally dystopian orientation.[75] In the 1930s and 1940s, the so-called "Golden Age" of science fiction, the techno-optimistic genre had moved from the margins of industrial culture to its mass-media center. Initially published in literary form, stories about the conquest of space gained immense popularity in the

72 Freyermuth, Gundolf S.: *Cyberland: Eine Führung durch den High-Tech-Underground*, Berlin: Rowohlt Berlin 1996, p. 33. (My translation.)—On Baudrillard, see Foster, Hal: *The Anti-Aesthetic: Essays on Postmodern Culture*, Port Townsend, WA: Bay Press 1983.

73 Hayles, N. Katherine: *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*, Chicago Ill.: University of Chicago Press 1999.

74 Schrage, Michael: "Cyberpunk and the Future of Technology," *Los Angeles Times*, April 19, 1990.

75 See for the following Lombardo, Tom: "Science Fiction as the Mythology of the Future," *academia.com*, https://www.academia.edu/1160808/Science_Fiction_as_the_Mythology_of_the_Future

new mass media of film, comics, and radio. Television further increased the genre's popularity in the subsequent "Silver Age" of the 1950s and 1960s. Concurrently, however, science fiction—irrespective of its medium and parallel to the general ideological change in Western societies—reversed its trajectory away from modernity and rational mastery of nature.

The achievements of the Enlightenment and, above all, technical and economic progress, the new means of production, transportation, and communication, as well as the mass prosperity it had brought to Western countries, lost their cultural esteem. The emergence of postmodern thinking created a "New Wave" of fiction about the future. It searched for meaning beyond industrial materialism and turned to environmental issues—nature and its destruction—as well as metaphysical problems, specifically the existence and perception of immaterial aspects of reality. The science fiction of the late 1960s and 1970s thus anticipated "the feeling and atmosphere of cyberpunk science fiction long before this movement had a name."[76]

However, the origins of cyberpunk, and particularly the concept of Cyberspace—as an immaterial space for action, a habitat, a futuristic medium in which brains network directly and communicate from mind to mind—date back further. The roots lie in the Enlightenment's rational approaches to understanding 'supernatural' phenomena as well as in the processes of immaterialization that began with industrialization and led to digitization and virtualization, i.e., the replacement of atoms with bits.

2 From World Spirit to Global Village: Origins of Cyberspace

Over the millennia, religions and other belief systems have provided 'explanations' for phenomena that are supposedly or actually beyond what our senses can perceive. With the scientific revolution and the Enlightenment, however, the need arose to understand such phenomena from a secular perspective, and thus the 18th and 19th centuries saw an increase in scientific research into immaterial natural phenomena such as magnetism, gravity, and electricity.

Philosophically, the turn to rationality marks Georg Wilhelm Friedrich Hegel's marginalization of the Christian "Holy Spirit" through the assertion of a secular "world spirit." Hegel defined it as the driving force of human history.[77] At the same time, he asserted the increasing dematerialization of the arts as their telos.

76 Ibid., p. 119.

77 Hegel, Georg Wilhelm Friedrich/ Miller, Arnold V./ Findlay, J. N.: *Phenomenology of Spirit*, Oxford: Clarendon Press 1977 [*1807].

The path traced by Hegel's pioneering historicization of aesthetic production at the beginning of the 19th century led from the heaviness of the symbolic epoch, whose foremost achievement was architecture, via the mastery of the 'lighter' sculptures of the classical epoch to the literature and ethereal music of the romantic epoch.[78] With the invention of the daguerreotype and photography a decade after Hegel's death, new ways of 'painting with light,' this historical tendency of the arts seemed to continue—to culminate, with Hegel in mind, in complete dematerialization.

Parallel to the rational elucidation of immaterial natural phenomena, scientific and technological progress constantly produced new dematerializations: the remote transmission of textual information through its—temporary—detachment from material storage in telegraphy since the 1840s, the remote transmission of speech through its detachment from the human body in fixed-line telephony since the 1870s and in radio since the 1890s, as well as the remote transmission of 'invisible' energy via electricity grids, which also began at the end of the century. At the same time, new transportation networks accelerated human exchange: the steam-powered railroad from the 1830s and gasoline-powered automobiles and airplanes from the 1920s. By the middle of the 20th century, these networks of communication and transportation would span the planet and enable not only the worldwide distribution of goods but also of news, art, and entertainment. The beginnings of cultural globalization in these decades were brought about, above all, by silent and sound films.

The social and cultural consequences of this change did not go unnoticed by contemporaries. Around 1928, for example, the philosopher and poet Paul Valery understood the dual process of dematerialization and networking as the "conquest of ubiquity" and thought of it in terms of a future basic domestic supply of 'flowing,' i.e., streamed, multimedia entertainment:

> "Just as water, gas, and electricity are brought into our houses from far off to satisfy our needs in response to a minimal effort, so we shall be supplied with visual- or auditory images, which will appear and disappear at a simple movement of the hand, hardly more than a sign."[79]

78 Hegel, Georg Wilhelm Friedrich/Bosanquet, Bernard/Inwood, M. J.: *Introductory Lectures on Aesthetics*, London; New York, NY: Penguin Books 1993 [*1835].

79 Valéry, Paul: "The Conquest of Ubiquity," in: *The Collected Works of Paul Valéry*, Princeton, NJ: Princeton University Press, 1956, pp. 225-226, here p. 226.—The passage is famously quoted by Benjamin, Walter: "The Work of Art in the Age of Mechanical Reproduction," in: *Illuminations. Essays and Reflections. Edited and With*

In the 1930s and 1940s, the Jesuit and paleontologist Pierre Teilhard de Chardin carried out the most forward-thinking analysis of techno-cultural change with regard to digitalization. His central interest lay in reconciling science with religion and evolutionary theory with Christian theology. In his opus magnum, *The Phenomenon of Man*, written around 1940, he described the creation of the world and life as a process of the constant evolution of consciousness, i.e., spiritualization.

First, the matter was created in "cosmogenesis." Life developed in the following "biogenesis." Only the third stage, "noogenesis," brought the development of consciousness.[80] According to Teilhard, evolution tends to produce increasingly complex nervous systems. As with artificial neural networks, more connections mean more consciousness, and more consciousness means more freedom and, ultimately, divinity. Evolution thus appeared to Teilhard as the pursuit of consciousness. Biological bodies were only its current carrier media: "The living world is constituted by consciousness clothed in flesh and bone."[81]

However, evolution, Teilhard postulated, does not end with Homo sapiens. What distinguishes humanity from other life forms is that we develop technologies enabling more complex and, therefore, more intelligent units of consciousness. Technical networking transcends biological limitations:

> "Through the discovery yesterday of the railway, the motor car and the aeroplane, the physical influence of each man, formerly restricted to a few miles, now extends to hundreds of leagues or more. Better still: thanks to the prodigious biological event represented by the discovery of electro-magnetic waves, each individual finds himself henceforth (actively and passively) simultaneously present, over land and sea, in every corner of the earth."[82]

An "accession to some sort of trans-humanity" seemed, therefore, imminent.[83] Teilhard—along with Julian Huxley, the brother of the author of the dystopian

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an Introduction by Hannah Arendt. Preface by Leon Wieseltier, New York, NY: Schocken Books 2007, pp. 217-252, here p. 219.— Reading these sentences in the 1950s, they seemed to foreshadow television; in the 1990s, the Internet.

80 Teilhard de Chardin, Pierre: *The Phenomenon of Man*, New York, NY: Harper 1965 [*1938-1940].—The Greek term "noos" means "mind, spirit, intellect."

81 Quoted from Cobb, Jennifer J.: "A Globe, Clothing Itself with a Brain," *Wired*, June 1995, http://www.wired.com/wired/archive/3.06/teilhard_pr.html

82 P. Teilhard de Chardin: *The Phenomenon of Man*, p. 240.

83 Teilhard de Chardin, Pierre: "From the Pre-Human to the Ultra-Human: The Phases of a Living Planet," in: *The Future of Man*, New York, NY: Harper & Row 1964 [*1951], pp. 290-298, here p. 298.

Brave New World—thus laid the philosophical foundations of transhumanism.[84] As digitalization advanced, the perspective that enhancing our species is an evolutionary imperative gained increasing traction among the rising class of networked knowledge workers.[85]

The adaptation of Teilhard de Chardin's ideas to secular thinking started in the 1960s. Marshall McLuhan defined media in general as an increase in human possibilities and the networks of electricity and television as the spread of the human nervous system across the material world.[86] Modifying Teilhard's earth-engulfing noosphere in terms of media studies, he described the status quo—more worldly—as an "electronic age," a "new world of the global village."[87] McLuhan's idea of humanity becoming more interconnected in the 20th century due to the propagation of media technologies and the planet turning into a village where everyone can communicate with everyone is easily recognizable as an analog prefiguration of Cyberspace.

3 Media on the *Frontier*: Cyberspace's Aftereffects

When William Gibson's *Neuromancer* was published in the summer of 1984, the Internet, the merger of previously incompatible digital networks, was just a year and a half old. Technical democratization was followed by social democratization. Government subsidies promoted the expansion and opening up of the Internet for civilian use. The net of the National Science Foundation (NSFnet) accelerated the connection of schools and colleges, giving millions of young Americans the formative experience of electronic communication—which in the 1980s was entirely text-based, from the control via command line interfaces to the transmitted content. Between 1981 and 1992, the number of computers permanently networked in the Arpanet/Internet rose from 281 to 1.1 million.[88] The restriction, which only allowed foreign connections to US military bases and embassies, gradually disappeared. (West) Germany, for example, was admitted to the Internet in the spring of 1989, four years after the first German edition of *Neuromancer*.

84 See Huxley, Julian: "Transhumanism," in: *New Bottles for New Wine*, London: Chatto & Windus 1957, pp. 13-17.

85 See J. J. Cobb: "A Globe, Clothing Itself with a Brain."

86 McLuhan, Marshall: *Understanding Media: The Extensions of Man*, Berkeley, CA: Gingko Press (Kindle Edition) 2013 [*1964].

87 Ibid., p. 101.

88 Data according to Gilder, George: "Issaquah Miracle," *Forbes ASAP*, June 7, 1993.

In the late 1980s, *The Well* developed as an intellectual center for discussing the cultural consequences of digital networking—and Gibson's imaginary media of Cyberspace. Stewart Brand, publisher of the hippiesque *Whole Earth Catalog*, set up the computer conference system in San Francisco in 1985.[89] One of the early members was John Perry Barlow, songwriter for the Grateful Dead. After one of Barlow's online posts, IT entrepreneur Mitch Kapor invited him to team up with free software activist John Gilmore to establish the *Electronic Frontier Foundation* (EFF), which is still the most important non-profit organization for defending fundamental freedoms in the data space. In a later contribution, Barlow adopted Williams Gibson's term "Cyberspace" to describe the contemporary Internet. In doing so, he initiated the popular use of Cyberspace in the 1990s—for a completely different, albeit graphic, Internet that was to bring over 350 million people online within a decade.[90]

Tim Berners-Lee initiated this exponential growth spurt in 1989, then at the European Institute of Particle Physics in Geneva, where he proposed a hypertext mask for the Internet.[91] It was to be independent of operating systems and would allow for more straightforward navigation and user-friendly linking of databases. In 1990, Berners-Lee began crafting such a hypertext system on a NeXT cube with the HyperText Markup Language (HTML) he had developed. The resulting World Wide Web (WWW) was to have a profound impact on the way in which humanity lives and works.

HTML itself resulted from a series of media utopias and technical efforts to realize them. In the mid-1940s, Vannevar Bush conceived the basic idea of networking civilizational knowledge. With his hypothetical Memex concept—short for "Memory Extender"—he intended to enable associative linking of data using analog technology.[92] Two researchers who read Bush's media utopia in their youth, Ted Nelson and Douglas Engelbart, attempted to realize Bush's vision in the 1960s and 1970s. First independently and then together, they created digital

89 Hafner, Katie: *The Well: A Story of Love, Death, and Real Life in the Seminal Online Community*, New York, NY: Carroll & Graf 2001.

90 Ritchie, Hannah et al.: "Internet," *OurWorldInData.org*, 2023, https://ourworldindata.org/internet

91 See Berners-Lee, Tim: "Information Management: A Proposal," 1989, http://www.w3.org/History/1989/proposal.html. Berners-Lee, Tim/ Fischetti, Mark: *Weaving the Web: The Past, Present and Future of the World Wide Web by Its Inventor*, London: Orion Business 1999.

92 Bush, Vannevar: "As We May Think," *The Atlantic Monthly*, July 1945, http://www.theatlantic.com/unbound/flashbks/computer/bushf.htm

hyperlinking.[93] On this basis, Bill Atkinson developed Apple's Hypercard program in the 1980s. At the same time, after he had to leave Apple, Steve Jobs incorporated hypertext into the operating system of his NeXT computer, thus enabling Berners-Lee to program HTML as the basis of the WWW.[94]

The first websites went online in 1991. By 1992, there were only around 50.[95] In 1993, Mosaic became the first browser to make this hypertext mask of the Internet accessible on regular PCs. The effects were dramatic. By the end of the year, 623 websites were online; in 1994, around 2700; in 1995, 23,500; by the turn of the century, over 17 million. Cyberspace was filling up and commercializing.

In the USA, 37 million people had access to the Internet in the mid-1990s, and 24 million went online regularly, on average five hours a week. This made them the online majority: 63 percent of all those "surfing" the WWW—as it was called at the time—were Americans, and only 21 percent were Europeans, although the population of the Old World was considerably larger. US institutions and corporations also operated most existing websites—universities, schools, the military, financial service providers, and IT companies. Digital technology became a central economic factor. By 1995, more people in the USA were earning their money from the manufacture, trade, and service of digital hardware and software than from any other product, including the heavy and automotive industries.[96]

Even before this transformation of the WWW into a medium of the masses, which took place in the second half of the nineties, the graphic Internet seemed to realize in the eyes of contemporaries what William Gibson had imagined as Cy-

93 Bush, Vannevar/Nyce, James M./Kahn, Paul (eds.): *From Memex to Hypertext: Vannevar Bush and the Mind's Machine*, Boston, MA: Academic Press 1991; Kahney, Leander: "HyperCard Forgotten, but Not Gone," *Wired News*, August 14, 2002, https://www.wired.com/2002/08/hypercard-forgotten-but-not-gone/

94 L. Kahney: "HyperCard Forgotten, but Not Gone."

95 The following is based on: Dibbell, Julian: "Nielsen Rates the Net," *Time*, November 13, 1995; Marshall, Andrew: "Suspicion Slows Europe's Hopes," *The WorldPaper Online*, May 1995; N.N.: "Phenomenal Internet Growth Will Continue," *Business Wire*, September 6, 1995; Staten, James: "America Online Stinging from Its Growing Pains," *MacWeek*, September 25, 1995; Staten, James: "NetTraffic," *MacWeek*, December 28, 1995. LaFrance, Adrienne: "A Search for the Zombie Websites of 1995," *The Atlantic*, April 21, 2017, https://www.theatlantic.com/technology/archive/2017/04/a-search-for-the-zombie-websites-of-1995/523848/

96 See Flanigan, James: "Technology Is No Mere Sector—It's Our Bedrock," *Los Angeles Times*, July 23, 1995.

berspace. Most of those who made use of the historically new opportunity to communicate and publish globally, without any censorship, almost free of charge and liberated from the editorial selection criteria of the established print media, felt like avant-gardists, regardless of which institution and profession they belonged to and which passion had lured them into virtuality, whether political activism, religious mission consciousness, the longing for intellectual exchange or the will for artistic expression. In 1996, I described the experience of digital networking:

"Like Paris in the 19th century, Cyberspace today is the scene of the most burning controversies and, at the same time, the most controversial place. The intellectual currents, artistic tendencies, and most advanced techniques of the era culminate in a colorful multimedia mixture of chaos theory and video art, genetics and cryonics, postmodern theory and pop music, online games and science fiction, mythology and nanotechnology, computer graphics and online sex [...]."[97]

In the same year, EFF board member John Perry Barlow published a "Declaration of Independence of Cyberspace," which caused a sensation:

"Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone. [...] We have no elected government, nor are we likely to have one, so I address you with no greater authority than that with which liberty itself always speaks. I declare the global social space we are building to be naturally independent of the tyrannies you seek to impose on us. "[98]

This radical libertarian assertion of Cyberspace as a politically free space beyond material reality complemented its perception as a realm of spiritual freedom. The ideas of Teilhard de Chardin and Marshall McLuhan were not only adhered to by prominent digerati—from John Perry Barlow to Louis Rosetto and Kevin Kelly, the founders of the authoritative high-tech magazine *Wired*, to the US Vice President and "information highway" builder Al Gore. Most of the academics who attempted to understand the historical and cultural significance of digital networking in the 1980s and 1990s were also guided by the models of these pioneers, the noosphere and the global village created by communication media: physicist and

97 G. S. Freyermuth: Cyberland, p. 27. (My translation.)

98 Barlow, John Perry: "A Declaration of the Independence of Cyberspace," February 8, 1996, http://www.eff.org/~barlow/Declaration-Final.html

computer scientist Peter Russell's *The Global Brain*[99] and biologist Gregory Stock's *Metaman: The Merging of Humans and Machines into a Global Superorganism*;[100] the futurologist Joël de Rosnay's *The Symbiotic Man*,[101] the hypermedia expert Pierre Lévy's *The Collective Intelligence*,[102] or the historian of science George Dyson's *Darwin Among the Machines: The Evolution of Global Intelligence*.[103]

The political and spiritual perspectives on Cyberspace, as well as the growing criticism of its rapid economization, which occurred in the United States in the 1990s, revolved around one term in particular: the *frontier*. Its conception refers to the historian Frederick Jackson Turner and his "The Significance of the Frontier in American History" speech. In it, he justified the rise of the USA as a nation at a historical congress in 1893 with "the existence of an area of free land, its continuing recession, and the advance of American settlement westward."[104] *Frontier* became "the dominant symbol of the Western myth" within a few years.[105] In 1990, John Perry Barlow took up the term and described the data space as another *frontier* of as-yet-uncharted territory, comparable "to the Wild West of the 19th century": "vast, undeveloped, culturally and legally open [...] a perfect breeding ground for both outlaws and new ideas of what freedom is."[106] In the same year, Barlow and Mitch Kapor started the *Electronic Frontier Foundation*.

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99 Russell, Peter: *The Global Brain: Speculations on the Evolutionary Leap To Planetary Consciousness*, Los Angeles, CA; Boston, MA: J.P. Tarcher; Distributed by Houghton Mifflin 1983.

100 Stock, Gregory: *Metaman: The Merging of Humans and Machines into a Global Superorganism*, New York, NY: Simon & Schuster 1993.

101 Rosnay, Joël de: *The Symbiotic Man: A New Understanding of the Organization of Life and a Vision of the Future*, New York, NY: McGraw-Hill 2000 [*1995].

102 Lévy, Pierre: *Collective Intelligence: Mankind's Emerging World in Cyberspace*, New York, NY: Plenum Trade 1997.

103 Dyson, George: *Darwin Among the Machines: The Evolution of Global Intelligence*, Reading, MA: Perseus Books 1998.

104 Quoted from Kapell, Matthew: *Star Trek as Myth: Essays on Symbol and Archetype at the Final Frontier*, Jefferson, NC: McFarland & Co. 2010, p. 8.

105 Tyrell, Blake Wm.: "Star Trek as Myth and Television as Mythmaker," in: Matthew Kapell (ed.), *Star Trek as Myth: Essays on Symbol and Archetype at the Final Frontier*, Jefferson, NC: McFarland & Co. 2010, pp. 19-28, here p. 31.

106 Barlow, John Perry: "Crime and Puzzlement: Desperados of the DataSphere," *Whole Earth Review* (Fall 1990).

The rampant growth of the WWW made the *frontier* the dominant buzzword. R.U. Sirius, editor-in-chief of the avant-garde cyberpunk magazine *Mondo 2000*, described Cyberspace in 1995 as "the new frontier, the frontier that consciousness is reaching today. We don't exactly know what awaits us. But we do know that from now on, we will no longer live only in our bodies and among our fellow human beings."[107] In the same year, James Gleick wrote in *The New Yorker*: "Cyberspace is as much a frontier as the New World was for seventeenth-century Europe. There is no reason to romanticize it. The frontier world is unpleasant, ugly and lawless."[108]

The narratives of cyberpunk tell of such *frontier* futures. During the 1980s, they emerged primarily in science fiction literature, and since the 1990s, also in popular science fiction films, from THE LAWNMOWER MAN[109] to STRANGE DAYS,[110] GHOST IN THE SHELL,[111] JOHNNY MNEMONIC,[112] LAWNMOWER MAN: BEYOND CYBERSPACE,[113] THE THIRTEENTH FLOOR[114] and EXISTENZ[115] to the transmedia franchise THE MATRIX,[116] which completed the canonization of cyberpunk. Its genre-typical elements not only influenced cinematic content, of course. In these years of transition from analog to digital cinema, cyberpunk also shaped the artistic hopes of numerous filmmakers. They aspired to overcome the many obstacles and contingencies that limited analog film production in the material world. The focus was on the immaterialization of audiovisual media's production and reception through advanced technology such as biodrugs and brain implants.

George Lucas, who is regarded as the "father of digital film"[117] since his company *Industrial Light & Magic* decisively advanced the transition from analog to

107 G. S. Freyermuth: *Cyberland*, p. 18. (My translation.)

108 Gleick, James: "Net Losses: Cyberhype Gives Way to Cybergripe in Unexpected Realms," *The New Yorker*, May 22, 1995.

109 THE LAWNMOWER MAN (USA 1992, D: Leonard, Brett).

110 STRANGE DAYS (USA 1995, D: Bigelow, Kathryn).

111 GHOST IN THE SHELL (JP 1995, D: Oshii, Mamoru).

112 JOHNNY MNEMONIC (USA 1995, D: Longo, Robert).

113 LAWNMOWER MAN 2: BEYOND CYBERSPACE (USA 1996, D: Mann, Farhad).

114 THE THIRTEENTH FLOOR (USA 1999, D: Rusnak, Josef).

115 EXISTENZ (CA/UK 1999, D: Cronenberg, David).

116 THE MATRIX (USA 1999); THE MATRIX RELOADED (USA 2003); THE MATRIX REVOLUTIONS (USA 2003); THE MATRIX RESURRECTIONS (USA 2021). All four movies directed bei Lana and Lilly Wachowski.

117 See, for example, the announcement of Lucas' 2005 ACMSIGGRAPH Keynote: "George Lucas: A Keynote Q&A; With the Father of Digital Cinema," https://history.

digital film in the 1980s and 1990s, imagined a dream-like combination of digital image generation and biotechnologically induced immersion in fiction in 1996:

"I see true environments being created and combined with a lot of the biotech things going on, in terms of manipulating people's senses through drugs [...] This combination will have the most powerful effect on the kind of storytelling we're doing today [...] they're already going there—creating images without actually making them, just as you create them in a dream."[118]

A year later, director and special effects pioneer Douglas Trumbull predicted: "We're not that far from being able to plant images, memories, and emotional states directly into the brain."[119] Furthermore, at the end of the century that film had culturally dominated, Walter Murch, a multiple Oscar winner for editing and sound design, speculated about the "invention of a black box that could directly convert a single person's thoughts into a viewable cinematic reality. You would attach a series of electrodes to various points on your skull and simply think the film into existence."[120]

These utopias of experienced filmmakers, reminiscent of Gibson's Cyberspace, extended the process of digitization—which had radically transformed their medium since the 1970s—to its logical conclusion. Common to their visions was the shift from an analog material production of linear audio-visuals to their rather 'spiritual' generation and reception: a cinema of thought. Their ideas pointed clear-sighted—albeit distorted and displaced as prophecies often are—to the virtualization of film production that would emerge a quarter century later with game engines, VR goggles, and LED walls.

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siggraph.org/learning/george-lucas-a-keynote-q-with-the-father-of-digital-cinema-by-lucas/

118 Quoted from M. C. Vaz/ Duignan, P. R.: *Industrial Light & Magic*, p. 279.— Huxley compared his clairvoyant conception of the *feelies* with the effects that could be achieved by combining photorealistic narratives and drugs. See Varricchio, Mario: "Power of Images/Images of Power in Brave New World and Nineteen Eighty-Four," *Utopian Studies* (January 1, 1999).

119 Greenwald, Jeff: "Trumbull's Vision," *Wired*, January 1997, http://www.wired.com/wired/archive/5.01/fftrumbull_pr.html

120 Murch, Walter: "The Future—A Digital Cinema Of the Mind? Could Be," *The New York Times*, May 2, 1999, http://www.nytimes.com/library/film/050299future-film.html

However, alongside the penetration of digital computers into everyday life, the historical process of virtualizing material tools and media, which inspired these visions of future media, was supplemented by a fundamentally opposing trend toward rematerialization. It became culturally effective during the 1980s—accompanied by the immediate popularity of a new utopian medium.

III HOLODECK

The transition from analog to digital processes and procedures in the late 20th and early 21st century can be portrayed as a great disappearance. Countless familiar devices were rendered obsolete—for example, calculators and typewriters, record players, radios, televisions, cassette and video recorders, landline telephones, photo and film cameras, sound and editing studios, plus the materials associated with these analog devices such as paper, celluloid strips, or magnetic tape. Software took over their functions in conjunction with ever smaller and portable computers: desktops, laptops, tablets, smartphones, and smartwatches. Along with this came a democratization of access—whether through institutional use or private ownership—as well as considerable performance improvements. The conversion of physical objects into data enabled an increasing number of individuals to perform tasks more efficiently, effectively, and economically than was previously possible in the material world.

However, when digital technology transitioned from laboratories and large institutions to small businesses and homes where individuals without the requisite training operated it, issues arose. In the short term, it was necessary to adapt the new technology to existing processes, which generally required physical data carriers and time to adjust and reorganize habitual practices. In the long term, if digital tools were to become ubiquitous, there was no way around 'humanizing' them, that is to say, to adapt these tools to the physical conditions of our species. The virtual realm had to be integrated in ways that allowed for more intuitive, 'natural' interactions. Consequently, in the second phase, complementary rematerializations occurred parallel to ever further virtualizations. As a corrective to the transformation of tangible objects into digital data, the data—that is, the virtualized tools and media—was to be given modes of representation that were more accessible to the human senses.

A primary—and from today's perspective, retrospective—effort was to output the results of virtual work using traditional printing methods. In the 1960s, the first commercial computer printers used the mechanisms of ball-head typewriters. In the 1970s, dot matrix printers came to the market, followed by laser printers in

the mid-1980s. In contrast to dot matrix printers, whose low-quality printouts revealed their computer origins, laser printers produced the look and feel of traditional offset letterpress printing, and soon in color. Since the end of the 1980s, this has facilitated what was known as desktop publishing, i.e., the privatization and personalization of publication processes beyond the limitations of mass printing. Around 1990, the possibility of burning data onto CD-ROMs for transportation or archiving was added. Nevertheless, as digitization advanced and, above all, broadband networking became established, enabling the rapid transfer of even large volumes of data, the various printing processes lost their importance.

A second adaptation effort was more future-oriented, focusing on the visualization and manipulation of digital data. In the 1940s and 1950s, the first computers generally communicated the results of their calculations via punched cards, sometimes also using small lamps or light-emitting diodes. It was not until after 1960 that cathode ray tube screens were employed to visualize both the entered and processed data. However, the representation was limited to letters and numbers. The first affordable computers with screens displaying graphics entered the market at the beginning of the 1980s. Subsequently, the graphical user interface (GUI) replaced command line control. This transition to a visual and, in the 1990s, audiovisual representation of digital data aligned with human perception and allowed the migration of established work practices to the virtual world.

However, the sensory representation of digital data—whether through analog printing on paper, celluloid, or other materials or via digital visualizations—differs categorically from corresponding analog practices. What exists virtually can be manipulated without any temporal constraints and can be materialized and visualized in unlimited numbers over any period, whether they are identical, as in analog mass production, or with ever-new minimal deviations, as in analog custom production. Consequently, the generation and dissemination of digital data no longer align with Walter Benjamin's reproduction theory, which posits both the content identity of copies and their generational degradation in technical quality. Instead, digital data and its copies or versions can be understood as instantiations.

The term originates from both computer science and classical philosophy. In object-oriented programming, instantiation designates realizations of fundamental units. It has the same meaning in *Massively Multiplayer Online Role-Playing Games* (MMORPGs): calling up a copy of a map or a dungeon. However, the term's origin lies in ontology, the study of being. In this field, it is defined as the act of creating individual representations of a universal concept. For instance, a specific chair can be considered an instantiation of the concept of chairs, as it is immediately recognizable and usable as a specimen of the genus.

The chair example indicates the three-dimensionality of our world. Until the mid-1980s, however, instantiations of digital data were limited to two-dimensional media. Physicist Chuck Hull took the decisive step from 2D to 3D. In 1984, he patented the stereolithography manufacturing process, laying the foundations for 3D printing. In 1987, Hall introduced the world's first printer that built up objects from various materials layer by layer freely in space—almost at the same time as the first episodes of STAR TREK: THE NEXT GENERATION[121] introduced their utopian 3D twin technologies: the Holodeck and the Universal Replicator.

1 STAR TREK: THE NEXT Generation

The 79 episodes of the inaugural STAR TREK series (1966-69)[122] conveyed a strong belief in progress and an unwavering optimism about the future. On the one hand, its creator, Gene Roddenberry, previously a Western screenwriter, drew on the original American myth of the strange and dangerous *frontier* and its exploration. To finance the series, he marketed it as "Wagon Train to the Stars."[123] The opening credits of each episode began with the words "Space: The Final Frontier" and ended with the now legendary phrase "to boldly go where no man has gone before."[124] An ideological core of STAR TREK was thus the Americanization of the conquest of space that began in the 1960s.[125]

On the other hand, these motifs of American mythology—the continuous westward migration and conquest of new territories—were accompanied by a multitude of technical and social innovations. The original STAR TREK series not only anticipated smartphones, tablet PCs, new medical practices, and the equal treatment of all races but also inspired young people to realize these imaginary innovations—from the developers of wireless telephony and non-invasive surgical procedures to NASA's first black female astronauts[126] to the inventors of the digital MP3 music format and Apple's engineers, who used STAR TREK's "The

121 STAR TREK: NEXT GENERATION (USA 1987-1994, O: Gene Roddenberry).

122 STAR TREK (USA 1966-69, O: Gene Roddenberry).

123 Whitfield, Stephen E./ Roddenberry, Gene: *The Making of Star Trek*, New York, NY: Ballantine Books 1968, p. 23.

124 The 'politically corrected' phrase "to boldly go where no one has gone before" was first used in the title sequence of STAR TREK: THE NEXT GENERATION.

125 M. Kapell: "Introduction: The Significance of the Star Trek Mythos," p. 21.

126 See HOW WILLIAM SHATNER CHANGED THE WORLD (USA 2005, D: Jones, Julian).

PADD" as a model for the iPad: "[W]hen revealing it in 2010, Steve Jobs showed a STAR TREK movie on the device."[127]

The contemporary context seemed to validate STAR TREK's techno-optimism. Just one month after the final episode aired on June 3, 1969, Neil Armstrong and Buzz Aldrin became the first humans to set foot on the moon. Nevertheless, the seventies dawned. The era of optimistic new beginnings ended, and not just in space. In 1972, the last man left the moon. Gene Roddenberry explicitly positioned the original series against postmodern hostility to progress and the resulting pessimism about the future, which gradually gained ground even in the science fiction genre. He explained the enduring popularity of STAR TREK with its positive message that all of humanity's problems could be solved:

> "There are many people saying, 'I doubt if we'll make it through the next twenty or thirty years.' And indeed, if you read the newspapers it seems so. STAR TREK was a rare show that said, 'Hey, it's not all over. It hasn't all been invented. If we're wise, why the human adventure is just beginning.'"[128]

The "myth" of STAR TREK, of which Wm. Blake Tyrrell spoke regarding the first series, was perpetuated 18 years after its discontinuation with STAR TREK: THE NEXT GENERATION. This sequel, which spanned 178 episodes from 1987 to 1994, was also, as Bruce Lincoln analyzed, "ideology in narrative form."[129] The Cold War, which had started the race to space in the late 1950s, persisted throughout the second half of the 1980s. The collapse of the Soviet empire, which was to occur just two years later, still seemed unimaginable. However, the two superpowers, the USA and the USSR, had largely abandoned the goal of conquering space and limited themselves to the deployment of satellites and probes, as well as a few crewed flights in Earth orbits.

Complementarily—and in keeping with the postmodern zeitgeist—in the multimedia genre of science fiction, space-faring futures increasingly focused on pessimistic scenarios. Dystopian themes and elements dominated the first three STAR

127 Kok, Steven: "The 'Futuristic' Sci-Fi Inventions That Inspired Modern-Day Tech," *The Next Web*, April 8, 2022, https://thenextweb.com/news/the-futuristic-sci-fi-inventions-inspired-modern-day-tech

128 Gene Roddenberry in his March 1976 *Penthouse* interview. Quoted from B. W. Tyrell: "Star Trek as Myth and Television as Mythmaker," p. 24.

129 Quoted from M. Kapell: "Introduction: The Significance of the Star Trek Mythos," p. 14.

WARS movies released between 1977 and 1983,[130] the MAD MAX, TERMINATOR and BATTLESTAR GALACTICA, GALACTICA, and V-TV franchises.[131] Compared to the prevailing mainstream of dystopian science fiction, the unbroken future optimism of STAR TREK's "post-scarcity utopia"[132] was an anomaly. This was evident not only in the five feature films produced by the franchise between 1979 and 1989 but also, more notably, in the sequel television series STAR TREK: THE NEXT GENERATION (1987-1994).[133]

Its pilot episode, ENCOUNTER AT FARPOINT, introduced the show's most spectacular new feature right away: the *holographic environment simulator*, or Holodeck for short.[134] This imaginary medium of the 24th century consisted of a high-tech chamber reminiscent of Plato's cave. The Starfleet Federation installed Holodecks on starships, space stations, and other institutions. Within the windowless rooms, computer-generated holographic environments could be experienced in a multi-sensory—haptic, olfactory, and gustatory—immersion. The material stabilization of the audiovisuals was explained within the STAR TREK fiction by a combination of futuristic techniques:

"Elements of transporter technology and replicators were used to create Holodeck matter by the manipulation of photons contained within force fields to give objects the illusion of substance as well as actual matter. This matter could exist outside of the Holodeck for brief periods of time (such as snow) before they would lose cohesion and revert back to energy without the support of the hologrid."[135]

130 THE EMPIRE STRIKES BACK (USA 1980, D: Kershner, Irvin).

131 For the franchises, see Wikipedia: "Mad Max," 2024, https://en.wikipedia.org/wiki/Mad_Max; Wikipedia: "Terminator (franchise)," 2023, https://en.wikipedia.org/wiki/Terminator_(franchise); Wikipedia: "Battlestar Galactica," 2024, https://en.wikipedia.org/wiki/Battlestar_Galactica

132 Chia, Galvin: "Archaeologies of the Future: Visions of the Future in Blockbuster Science Fiction Films, 1980 – 2016," May 9, 2017, https://demosjournal.com/article/archaeologies-of-the-future-visions-of-the-future-in-blockbuster-science-fiction-films-1980-2016/

133 For the franchise, see Wikipedia: "Star Trek," 2024, https://en.wikipedia.org/wiki/Please check this sentence from an academic paper: Star_Trek

134 ENCOUNTER AT FARPOINT—STAR TREK: THE NEXT GENERATION, Season 1, Episode 1 (USA 1987, D: Allen, Corey).

135 Ibid.

The Holodeck has remained an integral part of the STAR TREK universe. It appeared 114 times in STAR TREK: THE NEXT GENERATION, STAR TREK: DEEP SPACE NINE,[136] and STAR TREK: VOYAGER,[137] as well as in the four STAR TREK feature films released between 1994 and 2002.[138] The Holodeck also took on essential functions in the following 20 years, especially in STAR TREK: DISCOVERY[139] and the three seasons of STAR TREK: PICARD.[140]

As the most prominent and enduring of the imaginary holographic applications in science fiction since the 1980s, it brought holography into the mass cultural imagination and reinforced the "cultural desire for the holographic effect."[141] In the transmedia STAR TREK universe, the Holodeck soon developed from a pure novelty that aroused astonishment because it simulated significant—spatially or temporally distant—places, people, and events to a more complex element of the story world. On the one hand, it became a cinema-like heterotopic place where narratives could be experienced interactively.[142] On the other hand, individual Holodeck characters managed to overcome the separation from reality and penetrate the 'real' world of STAR TREK fiction.

Throughout all phases of its appearance, the primary function of the Holodeck persisted: the fulfillment of individual entertainment and educational needs like sporting and social activities such as fitness training, bar visits, erotic encounters, and tourist sightseeing. Dr. Crusher studied the anatomy of alien races on the Holodeck; Lieutenant La Forge trained on a simulated command bridge of the Enterprise-D; Lieutenant Whorf practiced martial arts; others visited jazz bars, French

136 STAR TREK: DEEP SPACE NINE (USA 1995-99, O: Rick Berman, Michael Piller).

137 STAR TREK: VOYAGER (USA 1995-2001, Rick Berman, Michael Piller, Jeri Taylor).

138 STAR TREK: GENERATIONS (USA 1994, D: Carson, David); STAR TREK: FIRST CONTACT (USA 1996, D: Frakes, Johnatan); STAR TREK: INSURRECTION (USA 1998, D: Frakes, Jonathan); STAR TREK: NEMESIS (USA 2002, D: Baird, Stuart); see Sezen, Tonguc Ibrahim: "Beyond the Holonovel. The Holographic Interactive Digital Entertainment Utopia of Star Trek," in: Benjamin Beil et al. (eds.), *Playing Utopia: Futures in Digital Games*, Bielefeld: transcript 2019, pp. 187-207, here p. 184.

139 STAR TREK: DISCOVERY (USA 2017-24, O: Bryan Fuller, Alex Kurtzman).

140 STAR TREK: PICARD (USA 2020-23, O: Akiva Goldsman, Michael Chabon, Kirsten Beyer, Alex Kurtzman); for the franchise, see Wikipedia: "Star Trek."

141 Boissonnet, Philippe: "Desire for Holographic Effect and Incomplete Gaze," *Archee: revue d'Art en ligne*, http://archee.qc.ca/ar.php?no=512&page=articl

142 For the Holodeck as a heterotopic place, see Chapter 2, *From Chambers of Wonders to Theme Parks: Origins of the Holodeck*, below.

cafés, or 20th-century comedy clubs.[143] At the next stage, the simulation machine became a storytelling machine. The 1988 episode THE BIG GOODBYE presents the first "holonovel."[144] In it, starship captain Jean-Luc Picard relaxes with an interactive detective story in the *film noir* milieu of the Californian 1940s. As a Sam-Spade-Phil-Marlowe-Humphrey-Bogart-like detective, he has to protect a young woman from gangsters. However, a malfunction overrides the Holodeck security mechanisms. Now confronted with deadly powers, Picard and his human teammates fight for their lives against the holo-gangsters. Other Holodeck narratives combine elements of the *Beowulf* saga or *Jane Eyre*-like gothic romance, Agatha Christie's Orient Express, or the Cold War world of James Bond into interactive experiences. What they have in common is that they are confined to the Holodeck—like the action of a play is confined to the stage or the events of a film to the screen.

The character of Professor James Moriarty—borrowed from the Sherlock Holmes novels—is an example of the third variant, in which Holodeck's fictions penetrate the spaceship's reality. When the android Data slips into the role of the master detective in the episode ELEMENTARY, DEAR DATA,[145] Holmes' nemesis Moriarty gains an awareness of himself, his thoughts, feelings, and actions. He no longer wants to be simply switched on and off as a program and instead requests a more human-like life. Moriarty manages to remotely assume control of the Enterprise-D from the Holodeck. To Captain Picard, he argues conclusively with René Descartes: "I think, therefore, I am." Picard has to recognize the hologram as a new life form because it is conscious. Nevertheless, Picard can convince Moriarty that Holodeck's characters cannot exist outside the force fields of the space that generates them. Moriarty resigns and returns to Enterprise-D's data storage facilities.

However, the potential for the characters generated in the Holodeck to spill over into 'reality' was set. The boundary between art and life became blurred—in keeping with romantic artistic ideals. Four years later, in the 138th episode, SHIP IN A BOTTLE, Moriarty's file was activated accidentally.[146] This time, he appeared

143 For the different uses of the Holodeck within the STAR TREK universe, see Fandom: "Holodeck," 2024, https://memory-alpha.fandom.com/wiki/Holodeck

144 THE BIG GOODBYE—STAR TREK: THE NEXT GENERATION, Season 1, Episode 12 (USA 1988, D: Scanlan, Joseph L.).

145 ELEMENTARY, DEAR DATA—STAR TREK: THE NEXT GENERATION, Season 2, Episode 3 (USA 1988, D: Bowman, Rob).

146 SHIP IN A BOTTLE—STAR TREK: THE NEXT GENERATION, Season 6, Episode 12 (USA 1993, D: Singer, Alexander).

to have successfully escaped the Holodeck. When the crew realized Moriarty had staged a holographic illusion, the Enterprise-D was under his control once more. Moriarty demanded, yet again, to be released from the Holodeck into reality. This time, Captain Picard eliminated the problem by pretending to Moriarty and his lover that he had found a solution:

"Moriarty relinquishes control of the Enterprise, and he and the Countess leave in a shuttlecraft to explore the universe. At that point, Captain Picard shuts down the program. Moriarty never left the Holodeck, it turns out, but they were able to give him the freedom he wanted through a computer program that will keep running and presenting them with new adventures for the rest of their 'lives.'"[147]

Moriarty's third appearance, 30 years later in the series STAR TREK: PICARD, shows him changed: The hologram of the episode THE BOUNTY no longer has access to the memories of his predecessor, but thanks to advanced holo-emitters he can move relatively freely in 'reality' and act as a dangerous 'real' antagonist.[148] It eventually comes to light that Moriarty is a security hologram and part of a hidden sign system. It originates in the consciousness of the android Data and is intended to guide the crew to his rescue.

Other examples of Holodeck characters who escape the realm of fiction and become part of 'reality' include the holographic singer Vic Fontaine in STAR TREK: DEEP SPACE NINE, who can control his holosuite and leave it with the help of a cloaking device, and the Doctor—an Emergency Medical Hologram (EMH)—on board the *USS Voyager*. The program develops consciousness and identity and even writes holo-novels. To interact freely with other crew members on the starship, the Doctor uses an advanced mobile emitter from the 29th century, which he has obtained during time travel.

In summary, the Holodeck allowed the generation of second-order narratives: stories embedded within the fictional plot of the television series. Four utopian media affordances characterized them. Firstly, the 'material' environments and characters generated by the computer—like all digital files—could be changed and 'deleted' immediately. Secondly, the virtual worlds were indistinguishable from present or past realities. Stylistically, the Holodeck pointed to a new form of

147 Krishna, Swapna: "Who is Professor James Moriarty?" *Startrek.com*, March 23, 2023, https://www.startrek.com/news/who-is-professor-james-moriarty

148 THE BOUNTY—STAR TREK: PICARD, Season 3, Episode 6 (USA 2023, D: Liu, Dan).

realism that was only just emerging in the 1980s—hyperrealism.[149] Produced with digital hardware and software, it supplements the artisanal realism of painting and the photorealism of industrially produced cameras in photography, film, and television. Thirdly, unlike the materially produced variants of analog realism, virtual hyperrealism enabled real-time modifications and thus increased immersion in reception, i.e., an entry into the image space and arbitrary interactions with its content. Fourthly, in principle, the holographic fictions were limited to the Holodeck's physical and explicitly non-networked space.[150]

Its separation from reality distinguished the Holodeck from the slightly older media utopia of Cyberspace and, at the same time, revealed its relationship to contemporary local-based entertainment installations (LBEs) like the attractions of arcades and theme parks. However, it was, above all, the first three qualities that pointed to the future: interactive physical immersion in hyperrealistic counterworlds. This promise cemented the Holodeck as a groundbreaking model for digital art and entertainment in the 1990s and 2000s—not only for millions of STAR TREK fans but also for leading researchers and audiovisual artists, especially filmmakers and game designers.

2 From Chambers of Wonders to Theme Parks: Origins of the Holodeck

STAR TREK: THE NEXT GENERATION presented the Holodeck as a futuristic development of the existing medium of analog holography. However, any discourse on holography in the 1980s was, by definition, oriented towards the future. After all, the medium—like the conquest of space, with which the new image medium is closely linked in phantasmagorical terms—was one of the spectacular futures that had been in vogue for quite some time and did not want to become the present. Holography was and still is primarily a myth, an interwoven series of stories about the future, both in popular culture and scientific research. In comparison, the reality of holographic applications in work and everyday life seems secondary, almost

149 For the term and its history, see G. S. Freyermuth: "Vegas, Disney, and the Metaverse," p. 64-65. —Jens Schröter observed: "[F]or the creators of the series the fictitious hyperrealism of the images in the holodeck has the advantage that one can have the alleged computer simulation acted out by completely normal actors in quite normal stage settings" (Schröter, Jens: *3D: History, Theory, and Aesthetics of the Transplane Image*, New York, NY: Bloomsbury 2014, p. 366, fn 107).

150 The escape of the characters from the holodeck into the "reality" of the spaceship, which occasionally looms or occurs, is considered a malfunction.

irrelevant. The gaping difference between what was hoped for and what was achieved reveals holography as an epochal model—and the Holodeck as a coveted heterotopos.

The term goes back to Michel Foucault. He observed that reality is not equally 'real' everywhere. Many familiar places exist outside everyday reality, as it were, because they are not freely accessible, and different rules apply within them. In contrast to the utopoi, the longed-for non-places, Foucault described these places as heterotopoi, counter-places.[151] He divided them into spaces of compensation and spaces of illusion. Among the latter, he included theater and cinema. The Holodeck is in their tradition but differs in one central detail: the audiovisual media that developed in modern times, from the peep-box stage to cinema and television to computer monitors, are based on the model of the framed window view, as established by perspective painting.[152] Overcoming this culturally dominant model of separation and control of the gaze and instead moving the distanced spectator into the image and action space has been a longing for centuries.

From perspective boxes and cabinets of curiosities, the path led to the panoramas and dioramas of the 18th and 19th centuries.[153] Their function was similar to some of the uses imagined by the creators of the Holodeck: They offered, at a time that knew no mass visual representation of current and exotic events, much less mass tourism, the unprecedented opportunity to visit realistic simulations of unknown places and to behold dramatic events of the recent or more distant past with one's own eyes. In the words of a contemporary of the first panoramas:

151 Foucault, Michel: "Of Other Spaces: Utopias and Heterotopias," *foucault.info*, 1967, translated from *Architecture, Mouvement, Continuité*, no. 5 (1984), pp. 46-49, https://foucault.info/documents/heterotopia/foucault.heteroTopia.en/

152 See Freyermuth, Gundolf S.: "From Analog to Digital Image Space: Towards a Historical Theory of Immersion," in: Burcu Dogramaci/Fabienne Liptay (eds.), *Immersion in the Arts and Media*, Amsterdam: Rodopi 2015, pp. 165-203, here pp. 179-184.

153 See for the following Buddemeier, Heinz: *Panorama, Diorama, Photographie. Entstehung und Wirkung neuer Medien im 19. Jahrhundert*, Munich: Fink 1970.; S. Oettermann: *The Panorama: History of a Mass Medium*; Pirr, Uwe: "Zur technischen Geschichte des Rundumblicks. Vom Panoramagemälde zur interaktiven Virtuellen Realität," in: Martin Warnke/Wolfgang Coy/Georg Christoph Tholen (eds.), *HyperKult: Geschichte, Theorie und Kontext digitaler Medien*, Basel; Frankfurt/M: Stroemfeld 1997, pp. 291-330.

"Certainly, a series of pictures of this kind [...] could enable thousands of people, without being forced to travel, to get to know the most important cities, the most important seaports, and the most interesting countries not only in Europe but also in other parts of the world."[154]

Panoramic installations—usually dedicated rotunda constructions that enabled 360-degree views and incorporated three-dimensional objects into their painted imagery—became a common entertainment medium throughout Europe. Only cinema ended the panorama's popularity after 1900. However, the return to the two-dimensional window view immediately reawakened compensatory longings. From the 1930s onwards, Walt Disney, founder of the world's most successful animation studio, looked for ways and means to offer the audience of his 2D productions a higher level of immersion. He called for "a cartoon that immerses the audience."[155] The solution that Disney finally decided on at the end of the 1940s established a new medium: the theme park. In terms of its historical function and cultural significance, it became comparable to the mechanical stage and the industrial cinema.

The inaugural theme park, Disneyland, opened in 1955 in a suburb of Los Angeles. It replaced the two-dimensionality of film images with built 3D backdrops populated by role-playing extras. "What he [Disney] was doing in his theme parks was producing his cartoon images in three dimensions."[156] In Disneyland, moviegoers previously tied to their seats turned into pedestrians navigating fictional spaces and riders on fast-paced attractions. The fantasy worlds of contemporary feature films and cartoons could be experienced multisensory for the first time.

154 Pierre-Henri de Valenciennes, 1800; quoted from Bätschmann, Oskar: *Entfernung der Natur: Landschaftsmalerei, 1750-1920*, Cologne: DuMont 1989, p. 94. (My translation.) Also: "Panoramas were a first of their kind, and on such a grand scale, to induce a sense of traveling to another time and place without having to travel too far; thus, they included some degree of physical transcendence" (Bown, Johnathan/White, Elisa/Boopalan, Akshya: "Chapter 12—Looking for the Ultimate Display: A Brief History of Virtual Reality," in: Jayne Gackenbach/Johnathan Bown (eds.), *Boundaries of Self and Reality Online*, San Diego, CA: Academic Press 2017, pp. 239-259, here p. 245.)

155 Thomas, Bob: *Walt Disney: An American Original*, New York, NY: Hyperion 1994, p. 11. Quoted from Pine, B. Joseph/Gilmore, James H.: *The Experience Economy: Work is Theatre & Every Business a Stage*, Boston, MA: Harvard Business School Press 1999, p. 47.

156 Blume, Mary: "Disney Conquers Another World: Design," *International Herald Tribune*, September 27, 1997.

Disneyland's attractions employed mechanical and electronic means to simulate 'safe' immersive participation in 'dangerous' events that could otherwise only be experienced with a certain degree of risk or significant cost. The individual subareas of the park, designated as "lands," were just as clearly "themed" and segregated from each other as the programs of the imaginary Holodeck were decades later. In the second half of the 20th century, theme parks quickly became the "most popular attraction on the earth."[157] Their enduring success results from retranslating 2D images of photography and film into 3D realities. In terms of media history, theme parks supplement the modern tradition of the distanced window view with physical immersion and participation.

This effort connects the theme park to another medium that emerged in the post-World War II era. Concurrently with Walt Disney traveling Europe in the late 1940s and gathering inspiration for his themed amusement park, physicist Dennis Gabor, who had sought refuge in the UK from the Nazi regime, discovered a method for recording and projecting three-dimensional images into space. Analog 2D photography only logged the amplitude and frequency of the object wave, i.e., graduated brightness and color. Gabor's method added the recording of the phase, i.e., the object's three-dimensional shape. He achieved this—theoretically—by using two overlapping light beams: One leads directly onto the image surface, the other across the object and deforms accordingly. The pattern of the superimposition of both beams is stored. In contrast to 2D photography, Gabor called his more holistic recording method holography and the resulting images holograms. Like 2D slides, they can be projected back into space in three dimensions and then perceived with the naked eye. Holography thus sought to achieve with the means of analog photography what theme parks started doing in the mid-1950s, employing architecture and set construction in the tradition of film and theater: "[T]he holographic dispositif breaks with the perspective tradition and opens a new field of artistic research and experimentation."[158]

In 1971, Dennis Gabor was to receive the Nobel Prize for his research. However, in the 1940s and 1950s, the technical means to implement the experimental concept in acceptable quality were still lacking. Based on calculations that Albert Einstein had made in 1917, the development of laser light in 1960 fundamentally

157 Gottdiener, Mark: *The Theming of America: Dreams, Visions, and Commercial Spaces*, Boulder CO: Westview Press 1997, p. 108.

158 Desbiens, Jacques: "The Dispositif of Holography," *Arts* 8, no. 1 (2019), pp. 28, https://www.mdpi.com/2076-0752/8/1/28

made the new imaging practice work.[159] This breakthrough marked the beginning of a pioneering phase in the mid-1960s. Holography established itself worldwide as a field of scientific research. At the same time, artistic experiments began. The seemingly weightless light sculptures fascinated their contemporaries, not least in the psychedelic counterculture. At the same time, the transition from static to moving holographs succeeded. In 1969, American physicists produced a 30-second holographic film showing tropical fish in an aquarium.[160] Exhibitions of holographic works, experimenting with light and movement in a way never seen before, attracted hundreds of thousands of visitors.[161] The first "School of Holography" opened in San Francisco in 1971, and the first "Museum of Holography" in New York in 1976.[162]

However, the actual progress of the new medium, as spectacular as it was at times, could not keep pace with the hopes placed in holography—even before its late 1940s invention. As early as 1922, the German-Polish author Alexander Moszkowski described a utopian 3D medium in his future novel *The Islands of Wisdom*: the "holographoscope." It could create realistic three-dimensional images of objects or scenes and project them into space.[163] In 1940, the Argentinian writer Adolfo Bioy Casares also imagined a revolutionary imaging method to populate the world with lifelike copies of long-dead people.[164] As with many technological achievements of the industrial era, from submarines to spaceships, the three-dimensional storage and projection of animate and inanimate matter were

159 Popper, Frank: *Art of the Electronic Age*, New York, NY: Harry N. Abrams 1993, p. 29.

160 Kac, Eduardo: "Beyond the Spatial Paradigm: Time and Cinematic Form in Holographic Art," *Sixth International Symposium on Display Holography*, 1998, https://www.spiedigitallibrary.org/conference-proceedings-of-spie/3358/0000/Beyond-the-spatial-paradigm--time-and-cinematic-form-in/10.1117/12.301482.short?SSO=1

161 Johnston, Sean F.: "Whatever Became of Holography?" *American Scientist*, November-December 2011, https://www.americanscientist.org/article/whatever-became-of-holography

162 Ibid.–Among the most successful pioneers of holographic art were the Americans Stephen Benton, Robert Whitman, James Turrell, and Rockne Krebs, the Dutchman Rudie Berkhout, and the German Dieter Jung.

163 Moszkowski, Alexander *Die Inseln der Weisheit: Geschichte einer abenteuerlichen Entdeckungsfahrt*, Berlin: F. Fontane & Co. 1922, https://archive.org/details/dieinselnderweis01mosz/page/n5/mode/2up

164 Bioy Casares, Adolfo: *The Invention of Morel*, New York: New York Review Books 2003 [*1940].

first imagined in literature long before the corresponding scientific and technological foundations were established.

Two years after the publication of Gabor's research on holography, in 1950, Ray Bradbury wrote "The World the Children Made," also known as "The Veldt."[165] In his short story, he described a fully automated house of the future, the "Happylife Home." Its amenities include a children's room equipped with a simulation device that generates images, sounds, smells, and haptic sensations as realistic as the Holodeck four decades later. The Veldt simulator was intended to entertain and educate children. However, they misappropriated it to have their parents torn apart by the lions of an Africa simulation. Jens Schröter writes:

> "Bradbury's short story is groundbreaking […] he already paint[s] the picture of a technologically generated, realistic, and immersive space in 1950, which functions without bulky data glasses and is interactive and haptic to the point of physical danger."[166]

"The Veldt" kicked off a stellar career for holography as a science fiction motif. A year later, the first installment of Isaac Asimov's *Foundation* trilogy was published.[167] In it, holography played a significant role in preserving the prophecies of the founder of the Foundation and making them accessible to future generations.

Since then, thousands of short stories and novels, feature films, TV series, and digital games have depicted holographic characters and worlds. The most notable examples from the 1950s to the present include FORBIDDEN PLANET,[168] FAHRENHEIT 451,[169] THIRTEENTH FLOOR, THE MATRIX, MINORITY REPORT,[170]

165 Bradbury, Ray: "The World the Children Made (republished as 'The Veldt')," *Saturday Evening Post*, September 23, 1950, https://www.studocu.com/en-us/document/fresno-high-school-ca/ap-government/the-veldt-full-text/37724113

166 Schröter, Jens: "Das Holodeck als Leitbild," in: Luise Feiersinger (ed.), *Scientific Fiction: Inszenierungen der Wissenschaft zwischen Film, Fakt und Fiktion*, Berlin: De Gruyter 2018, pp. 90-99, here p. 92. (My translation.)

167 Asimov, Isaac: *Foundation*, New York, NY: Gnome Press 1951; *Foundation and Empire*, New York, NY: Gnome Press 1952; *Second Foundation*, New York, NY: Gnome Press 1953.

168 FORBIDDEN PLANET (USA 1956, D: Wilcox, Fred M.).

169 FAHRENHEIT 451 (UK 1966, D: Truffaut, François).

170 MINORITY REPORT (USA 2002, D: Spielberg, Steven).

AVATAR,[171] READY PLAYER ONE,[172] and THE CREATOR.[173] Digital games address holography in even greater numbers. Worth mentioning are, among others, STAR OCEAN,[174] COMMAND & CONQUER: RED ALERT,[175] METAL GEAR SOLID 2: SONS OF LIBERTY,[176] ASSASSIN'S CREED,[177] HALO: REACH,[178] CRYSIS 2,[179] HORIZON ZERO DAWN,[180] and APEX LEGENDS.[181] Compared with the highly developed variants of holography presented in science fiction, existing applications disappoint with a certain inevitability.[182] For decades, the myth of holography—analyzed by David J. Pizzanelli as an expression of mass psychological needs—has overshadowed all actual holograms.[183]

Concurrently, science fiction has informed research and technological endeavors. Two mass cultural franchises, STAR WARS and, later, STAR TREK, played a unique role in creating public expectations and guiding holographic experiments.[184] In STAR WARS: A NEW HOPE, the robot R2-D2 projects a holographic message from Princess Leia, which she recorded shortly before her arrest, asking Obi-Wan Kenobi for help. This pivotal scene in the movie changed Luke Skywalker's life forever—and catapulted the hologram as a guiding model into global mass culture. "[E]ver since then, geeks have been obsessed with making that technology real."[185]

171 AVATAR (USA 2009, D: Cameron, James).

172 READY PLAYER ONE (USA 2018, D: Spielberg, Steven).

173 THE CREATOR (USA 2023, D: Edwards, Gareth).

174 STAR OCEAN (Square Enix 1996, O: Enix, tri-Ace).

175 COMMAND & CONQUER: RED ALERT (Virgin Interactive 1996, O: Westwood, Studios).

176 METAL GEAR SOLID 2: SONS OF LIBERTY (Konami 2001, O: Kojima Productions, Hideo Kojima).

177 ASSASSIN'S CREED (Ubisoft 2007, O: Ubisoft, Montreal).

178 HALO: REACH (Microsoft Game Studios 2010, O: Bungie).

179 CRYSIS 2 (Electronic Arts 2011, O: Crytek).

180 HORIZON ZERO DAWN (Sony Interactive Entertainment 2017, O: Guerrilla, Games).

181 APEX LEGENDS (Electronic Arts 2019, O: Respawn, Entertainment).

182 See P. Boissonnet: "Desire for Holographic Effect and Incomplete Gaze."

183 See Pizzanelli, Daniel J.: "The Evolution of the Mythical Hologram," *Proceedings of the SPIE. The International Society for Optical Engineering* (1992), pp. 430-437.

184 S. F. Johnston: "Whatever Became of Holography?"

185 Stinson, Liz: "For $95,000 You Can Create Your Own Princess Leia Hologram," *Wired*, November 15, 2013, https://www.wired.com/2013/11/for-95000-you-can-create-your-own-princess-leia-hologram/. In 2011, researchers at the Massachusetts

STAR TREK's Holodeck, introduced a decade later, differed from STAR WARS' Leia in a significant new quality: its materiality. Gene Roddenberry had the idea of incorporating a futuristic entertainment center in his series as early as 1968 but could not implement it for cost reasons.[186] Roddenberry then met holography researcher and inventor Gene Dolgoff in 1973. Dolgoff remembers:

"I introduced the concept [... of] matter holograms. At that point, holograms were used to generate three-dimensional images, but you could pass your hand through the images. [...] I'd realized that matter is made up of interference patterns of energy as well, and so you could actually record a hologram of the structure of matter and then reproduce the matter in the same way."[187]

Roddenberry integrated Dolgoff's idea into the second season of STAR TREK: THE ANIMATED SERIES (TAS) the following year.[188] The episode THE PRACTICAL JOKER showed

"a total immersion, three-dimensional entertainment technology that provides computer-generated environments, characters, and dramatic contexts. [...] The Holodeck in TAS began as a recreation center for the crew to reconnect to simulated natural landscapes while on long missions."[189]

The 1970s and 1980s were a heyday for similar thought experiments in the Total Work of Art and Total Cinema tradition. In 1973, Michael Crichton depicted realistic—and anachronistically speaking Holodeck-like—high-tech theme parks

Institute of Technology (MIT) recreated the decades-old hologram of Princess Leia using a Microsoft Kinect camera and standard graphics chips—with the highest frame rate to date when streaming a holographic video, yet with wholly inadequate quality. (Hardesty, Larry: "3-D TV? How about Holographic TV?," *MIT News*, January 24, 2011, https://news.mit.edu/2011/video-holography-0124).

186 T. I. Sezen: "Beyond the Holonovel," p. 190.

187 Staff, Startrek.com: "Meet the Man Behind the Holodeck, Part I," *Startrek.com*, March 11, 2014, https://www.startrek.com/article/meet-the-man-behind-the-holodeck-part-1

188 STAR TREK: THE ANIMATED SERIES (USA 1973-64, O: Gene Roddenberry); THE PRACTICAL JOKER–STAR TREK: THE ANIMATED SERIES (USA 1974, D: Reed, Bill).

189 Fogel, Dara: "Life on a Holodeck: What Star Trek Can Teach Us about the True Nature of Reality," in: Jason T. Eberl/Kevin S. Decker (eds.), *The Ultimate Star Trek and Philosophy*, Malden, MA: John Wiley & Sons 2016, pp. 273-287, here p. 276.

with human-like cyborgs in his film WESTWORLD.[190] The fictitious parks, created to blur the line between reality and art or, more accurately, entertainment, were supposed to provide a safe and secure environment for visitors to engage in any adventure, including violence and sex. Also in 1973, the Soviet science fiction film MOSCOW-CASSIOPEIA featured a Holodeck-like "Surprise Room."[191] A year later, the Japanese television series SPACE BATTLESHIP YAMATO introduced a simulative "Resort Room."[192]

Concurrently, Douglas Trumbull worked to create comparable immersive experiences through physical installations.[193] In addition to his career in Hollywood film—during these years, he was responsible for the special effects of science fiction classics such as 2001: A SPACE ODYSSEY,[194] SILENT RUNNING,[195] CLOSE ENCOUNTERS OF THE THIRD KIND,[196] and BLADE RUNNER[197]—Trumbull experimented with new formats intended to increase the immersion of both the film and the theme park. The obvious choice was to intensify the visual effect. To this end, Trumbull initiated the development of *Showscan* in 1975. The innovative technology enhanced the quality of the conventional 70 mm film by recording 60 frames per second, as opposed to the previous rate of 24 frames per second.

A second method employed the intensification of audiovisual effects using multiple sensory modalities. "I finally came to the revelation that the future of the cinema, in terms of an immersive experience, was occurring outside of mainstream cinema—in theme park rides and attractions and world's fairs."[198] This insight made Trumbull the most influential pioneer of motion cinema. As early as 1974, he designed the first motion capsule in which cinematic sensations could be physically experienced. Ten years later, he realized A TOUR OF THE UNIVERSE for twelve million dollars.[199] The Toronto attraction simulated a spaceport in 2019,

190 WESTWORLD (USA 1973, D: M. Crichton).

191 MOSCOW-CASSIOPEIA (UDSSR 1974, D: Viktorov, Richard).

192 SPACE BATTLESHIP YAMATO (JP 1974-1975, D: x, O: Leiji Matsumoto, Yoshino-bu Nishizak, and Eiichi Yamamoto).

193 See G. S. Freyermuth: "Vegas, Disney, and the Metaverse," p. 75-77.

194 2001: A SPACE ODYSSEY (USA 1968, D: Kubrick, Stanley).

195 SILENT RUNNING (USA 1972, D: Trumbull, Douglas).

196 CLOSE ENCOUNTERS OF THE THIRD KIND (USA 1977, D: Spielberg, Steven).

197 BLADE RUNNER (USA 1982, D: Scott, Ridley).

198 J. Greenwald: "Trumbull's Vision."

199 A TOUR OF THE UNIVERSE (Toronto 1985-1992, O: Trumbull, Douglas); Conroy, Ed: "The History of the Tour of the Universe Spaceship Simulator at the CN Tower,"

from which a shuttle departed on a round trip to Jupiter. The flight itself combined a computer-controlled hydraulic motion platform, developed initially for fighter pilot training and holding forty people in the entertainment version, with a seven-minute *Showscan* f/x film costing two million dollars alone, which was produced using all available means of analog magic and then presented on a spherical screen.

The success of A TOUR OF THE UNIVERSE proved the viability of the experimental concept and aroused George Lucas' interest. He had already founded a department for digital games in 1982 to open further exploitation possibilities for the STAR WARS saga but also to overcome the passive reception inherent in cinema in the direction of playful participation. Now, he designed—together with several Disney Imagineers—a STAR WARS-themed movie ride based on the ride system and its controls that Trumbull had developed. In 1987—the year of the Holodeck—the STAR TOURS opened at *Disneyland*.[200]

In terms of media history, STAR TOURS and the numerous similar installations created in theme parks worldwide in the following years are in the tradition of the panorama and diorama. Like these predecessor media, "movie rides" allow visitors to physically enter distant or fictional worlds. However, what theme parks offered at the end of the 20th century went far beyond simple sightseeing. In combining moving apparatuses with immersive films—soon supplemented by live acting—the most advanced installations aimed at hybrid, i.e., partly physical, partly virtual participatory fiction, as promised by the fictional Holodeck.

3 From Role Model to Resurrections and Displaced Hopes: Holodeck's Aftereffects

Since its introduction almost 40 years ago, the Holodeck has advanced to become a utopian model for digital storytelling, primarily due to its double promise to offer a closed narrative space for three-dimensional interactive audiovisions and to extend narratives from its "magic circle" into reality, akin to pervasive games. In both media theory and media practice, the Holodeck serves as a paradigm for the potential interplay between narrative and user participation. Janet Murray established this perspective in 1997 with *Hamlet on the Holodeck*. In this monograph,

blogTO, October, 2019, https://www.blogto.com/city/2020/09/tour-of-the-universe-cn-tower/

200 STAR TOURS (Disneyland 1987-2010, O: Lucas, George and Disney Imagineers). A year after STAR TOURS closed, a successor ride opened.

she explored the narrative potential of the software transmedium, recognizing Gene Roddenberry's visionary pop fantasy:

"The format that most fully exploits the properties of digital environments is not the hypertext or the fighting game but the simulation: the virtual world full of interrelated entities, a world we can manipulate, and observe in process."[201]

For Murray, the Holodeck points toward "a universal fantasy machine, open to individual programming: a vision of the computer as a kind of storytelling genie in the lamp."[202] The fusion of human and procedural authorship leverages digital technologies to transcend the limitations of storytelling in analog audiovisual media. Thus, the imaginary Holodeck represents a transformative space where narratives are no longer merely consumed but experienced—participatory and immersively engaging the participants' bodies. The new art form within the Holodeck medium, the holo-novel,

"offers a model of an art form that is based on the most powerful technology—of sensory illusion imaginable but is nevertheless continuous with the larger—human tradition of storytelling, stretching from the heroic bards through the nineteenth-century novelists."[203]

In the nearly three decades since Murray published her seminal text, numerous media theorists and media practitioners have engaged with the concept of the Holodeck.[204] Tonguc Ibrahim Sezen summarized 2019 that the Holodeck still plays a "prominent role in academic discussions [...] as a utopia for interactive digital entertainment".[205] Murray's Holodeck analysis particularly influenced research into

201 Murray, Janet Horowitz: *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*, Cambridge, MA: The MIT Press 2017 [*1997], p. 259.

202 Ibid., p. 24.

203 Ibid., p. 32.

204 In the early German-language discourse up to 2010, for example: Freyermuth, Gundolf S.: "Holodeck heute," *c't–magazin für computertechnik*, August 30, 1999, pp. 72-77, http://freyermuth.com/reprints/archiv2008/reprintJMar2008/Holodeck_heute.html; Freyermuth, Gundolf S.: "Von A nach D. Zwischen Hype und Utopie: Am Horizont der Digitalisierung von Kunst und Unterhaltung lockt das Holodeck," in: Rudolf Maresch/Florian Rötzer (eds.), *Cyberhypes*, Frankfurt/M: Edition Suhrkamp 2001, pp. 213-232. Schröter, Jens: *3D. Zur Geschichte, Theorie und Medienästhetik des technisch-transplanen Bildes*, Munich: Fink 2009.

205 T. I. Sezen: "Beyond the Holonovel," p. 187.

interactive digital storytelling (IDN). Mads Haahr stated in 2002: "Janet Murray's proposal of the Holodeck as an immersive environment for interactive digital storytelling [...] has served as a guiding metaphor for researchers in interactive digital narrative since it was proposed."[206] A decade later, Hartmut Koenitz outlined the promises and problems of the Holodeck as an inspirational framework in his foreword to the anthology *Interactive Digital Narrative: History, Theory and Practice:*

"The Holodeck is a powerful metaphor for interactive digital narrative, but it is also a limiting one. It implies a level of immersion and interactivity that is not yet achievable, and it may not even be desirable for all kinds of stories and experiences. It also suggests a passive role for the audience, who are expected to follow a pre-defined plot and react to stimuli, rather than actively shape the story and express themselves creatively."[207]

In his assessment, Koenitz is already considering the criticism that Janet Murray's praise of the Holodeck as a model for digital storytelling has received over the years. Marie Laure Ryan voiced the first objections. Some of them were related to accidental issues of technical feasibility. However, the criticism directed at the psychological challenges of Holodeck-like narratives was more essential: "[E]ven if the hardware and software problems could be resolved, an important question remains. What kind of gratification will the experiencer receive from becoming a character in a story?"[208] Ryan posited that literary fiction is received in a complex manner, encompassing both identification and distance. While readers mentally simulate the characters' inner lives, they simultaneously maintain an awareness of external observation. In contrast, the Holodeck conveys emotional experiences in the first person. This shift from mental identification to experiencing real feelings limits possible themes and situations and, thus, the narrative potential:

206 Haahr, Mads: "Everting the Holodeck: Games and Storytelling in Physical Space," in: Hartmut Koenitz et al. (eds.), *Interactive Digital Narrative: History, Theory and Practice*, New York, NY: Routledge, Taylor & Francis Group 2015, pp. 211-226, here p. 211.

207 Koenitz, Hartmut: *Understanding Interactive Digital Narrative: Immersive Expressions for a Complex Time*, London; New York, NY: Routledge, Taylor & Francis Group 2023, p. 8.

208 Ryan, Marie-Laure: "Beyond Myth and Metaphor: The Case of Narrative in Digital Media," *Game Studies*, July 2001, https://www.gamestudies.org/0101/ryan/

"Interactors would have to be out of their mind—literally and metaphorically—to want to submit themselves to the fate of a heroine who commits suicide as the result of a love affair turned bad, like Emma Bovary or Anna Karenina. Any attempt to turn empathy, which relies on mental simulation, into first-person, genuinely felt emotion would in the vast majority of cases trespass the fragile boundary that separates pleasure from pain."[209]

What Ryan called the "narrative myth" of the Holodeck in 2001 was subsequently also addressed by Espen Aarseth. His study *Cybertext: Perspectives on Ergodic Literature,* fundamental to game studies as well, was published almost concurrently with Murray's *Hamlet on the Holodeck*.[210] In contrast to Murray's focus on the narrative qualities of the digital transmedium, Aarseth emphasized the ludic-mechanical elements of procedural works and, in particular, digital games. In his 2004 essay, "Genre Trouble: Narrativism and the Art of Simulation," he continued this critique of the application of narratological perspectives, underscoring the conflict between scripted interactive experiences and interactive actions that have consequences and meaning. Aarseth referred to the "Holodeck myth" as "story-game ideology."[211]

"Underlying the drive to reform games as 'interactive narratives,' as they are sometimes called, lies a complex web of motives, from economic ('games need narratives to become better products'), elitist and eschatological ('games are a base, low-cultural form; let's try to escape the humble origins and achieve 'literary' qualities'), to academic colonialism ('computer games are narratives, we only need to redefine narratives in such a way that these new narrative forms are included')."[212]

Rune Klevjer[213] and Jay Bolter also expressed opposition to the Holodeck as a model for digital fiction or even digital games. Bolter refers to the Holodeck as "a

209 Ibid.

210 Aarseth, Espen J.: *Cybertext: Perspectives on Ergodic Literature*, Baltimore, MD: Johns Hopkins University Press 1997.

211 Aarseth, Espen: "Genre Trouble: Narrativism and the Art of Simulation," in: Noah Wardrip-Fruin/Pat Harrigan (eds.), *First Person: New Media as Story, Performance, and Game*, Cambridge, MA: MIT Press 2004, pp. 45-55, here p. 49.

212 Ibid.

213 Klevjer, Rune: *What is the Avatar? Fiction and Embodiment in Avatar-Based Single-player Computer Games*. PhD Thesis, University of Bergen 2006), p. 66, https://bora.uib.no/bora-xmlui/bitstream/handle/1956/2234/Dr._Avh_Rune_Klevje.pdf?sequence=1

technical chimera" and states: "It is not clear that our culture wants the Holodeck."[214] In cultural practice, however, efforts to emulate the Holodeck utopia in some form or another have prevailed. For example, game designer and filmmaker Greg Roach declared at the end of the 1990s:

"Ultimately all interactivity is a sham. Until we have true dynamic artificial intelligence, agents, artificial personalities, it's all a sham. Until we can create the Holodeck in STAR TREK, we are setting up a set of parameters and giving people the illusion of control and the illusion of interactivity."[215]

Practical efforts to create more Holodeck-like sensations encountered the fundamental obstacle that no suitable technologies exist for even an approximate realization of the futuristic concept and, as Lawrence M. Krauss wrote in 1995 in *The Physics of Star Trek,* will probably not exist for the foreseeable future.[216] The numerous attempts to circumvent the limitations of existing technology can be divided into three categories.

Firstly, in continuation of the material construction of fictional 3D worlds initiated by Disney, there was a boom in installations that combined *first-person film rides* with the construction of themed sets and the use of costumed actors, thus offering physical immersion in staged actions and partial interaction with their characters.[217] Two such rides, created in the 1990s, operated remarkably close to the technical limits. In 1993, Douglas Trumbull produced IN SEARCH OF THE OBELISK for the Las Vegas Luxor Hotel & Casino.[218] The technical superiority of the ride resulted from the then-innovative combination of live-action film and

214 Bolter, J. David: "Transference and Transparency: Digital Technology and the Remediation of Cinema," *Revue Intermédialités*, no. 6 (Fall 2005), pp. 13-26, here p. 26.

215 Quoted from Neuhaus, Wolfgang: "Auf der Suche nach einer 'Meta-Dramaturgie' oder: Die Schwerkraft der Erzählung," in: Wolfgang Jeschke (ed.), *Das Science Fiction Jahr Ausgabe 1999*, Munich: Heyne 1999, pp. 520-543.

216 Krauss, Lawrence Maxwell: *The Physics of Star Trek*, New York, NY: Basic Books 1995.

217 The following is based on G. S. Freyermuth: "Vegas, Disney, and the Metaverse," pp. 75-80.

218 IN SEARCH OF THE OBELISK (Las Vegas Luxor Hotel & Casino 1993-2004, O: Trumbull, Douglas and Arish Fyzee).

computer graphics.[219] A motion device developed by Trumbull and controlled by 40 Silicon Graphics workstations and a dozen other computers synchronized the hybrid—partly photorealistic, partly hyperrealistic[220]—images of the ride movie with the movements of a pneumatic motion platform.[221] IN SEARCH OF THE OBELISK was, in Trumbull's words, an "experiment in finally going over the edge of a belief barrier through careful control of photography and projection, to the point where a motion picture can be seen to be a real live event." [222]

An even more artistically and technically advanced effort to emulate the Holodeck in analog-digital hybridity undertook STAR TREK: THE EXPERIENCE.[223] The 70 million-dollar installation opened in 1998 after three years of construction.[224] Covering 600 square meters in the Las Vegas Hilton, it offered a hyper-realistic 'replica' of the space station from STAR TREK: DEEP SPACE NINE.[225] The digitally controlled 3D backdrops combined elements of a museum and dinner theater with two high-tech simulations in 37 STAR Trek-themed scenes: A 'real' elevator ride in the Museum of the Future, which ended with the virtual abduction of guests by "beaming," was followed by their Starfleet officer-driven escape from intergalactic enemies to a rescue shuttle and then the actual ride, a four-minute rollercoaster flight through space. The immersive experience ended after 22 minutes with the shuttle crash-landing on the Las Vegas Strip.

In the first six months after opening, 700,000 visitors flocked to the attraction. At peak times, around 2000 paying 'time travelers' per hour were transported to the simulated future. The central attraction of STAR TREK: THE EXPERIENCE was the opportunity to physically participate in a popular mass cultural fiction in the

219 See Swain, Bob: "Specialley Effective Fun: Interactive Movies," *The Guardian*, August 25, 1994.

220 Gorman, Tom: "Weekend Escape: Las Vegas; The Strip Says, 'Kids, Got Clean Thrills For You, But You Gotta Bring Your Boring Parents. Deal?'," *Los Angeles Times*, November 20, 1994, p. 22.

221 B. Swain: "Specialley Effective Fun."

222 Rheingold, Howard: "Total Immersion. Douglas Trumbull's Big Budget VR," *Wired*, November 1993, http://www.wired.com/wired/archive/1.05/luxor.html

223 STAR TREK: THE EXPERIENCE (Las Vegas Hilton 1998-2008, O: Landmark Entertainment). See G. S. Freyermuth: "Holodeck heute."

224 Rubin, Judith: "Are You Experienced? Landmark Entertainment, Paramount Parks, and a Galaxy of Artisans Beam Aboard the $70 Million Star Trek Extravaganza at the Las Vegas Hilton," *TCI (Theatre Crafts International)*, April 1998.

225 N.N.: "Presskit Star Trek—The Experience," 1999. See also G. S. Freyermuth: "Holodeck heute."

same way as the Holodeck promised. "The experience most people have had with STAR TREK over the years has focused on watching television or a movie," said producer Rick Berman. "This blows away the proscenium."[226]

The emphasis on the first-person perspective in the play-along narrative and ride was particularly appealing. The integration of this point of view characteristic of digital flight simulators represented a consistent continuation of the general tendency towards subjectivization in 20th-century art and entertainment, as seen in the literary *stream of consciousness* or the subjective camera of experimental cinema. Such direct experiences—like the new game genre of the first-person shooter (FPS), which became successful at the same time—resonated with a contemporary audience that, in their work and everyday lives, saw objective material requirements and constraints increasingly replaced by virtualized, customizable, and individually controllable processes.

The high-tech synchronization of moving images with their correlating motor sensations, as offered by the film rides to a broad audience for the first time, made more radical use of the expanded digital possibilities for multisensory illusion than cinema, which merely enhanced some of its images hyperrealistically. However, beyond the physical experience of scenes from movies or TV series, the film rides hardly offered any meaningful interactions, as Erkki Huhtamo noted:

> "Although motion simulators have tried to bridge the gap between the audience space and the virtual world of the screen and to create a more dynamic response from the passengers, they still share a very traditional nineteenth-century conception about the audience. It was encountered in the diorama as well as in the opera or the melodrama theater."[227]

A second category of techno-aesthetic experiments sought to create Holodeck-like effects by employing the technology that had given it its name. One of the earliest science fiction visions of holographic media was, as mentioned, the resurrection of the dead. STAR TREK'S imaginary Holodeck also repeatedly simulated historical characters—from Leonardo da Vinci and Isaac Newton to Mark Twain, Mata Hari, Sigmund Freud, and Albert Einstein. In the early 2000s, the digital upgrade of analog holography rendered it technologically feasible to create holographic images of the deceased that could be animated to resemble the appearance of a living person, thereby enabling limited interaction with these holograms. The

226 Quoted from N.N.: "Presskit Star Trek—The Experience."

227 Huhtamo, Erkki: "Encapsulated Bodies in Motion: Simulators and the Quest for Total Immersion," in: Simon Penny (ed.), *Critical Issues in Electronic Media*, Albany, NY: State University of New York Press 1995, pp. 159-186, here p. 174.

spectacular start was the resurrection of Tupac Amaru Shakur by the special effects studio Digital Domain and the two holo companies AV Events and Musion Systems. Tupac was shot dead in Las Vegas in 1996. Fifteen years later, at the 2012 Coachella Valley Music & Arts Festival in California, the legendary rapper sang the 1996 hit "2 Of Amerikaz Most Wanted" 'live' in front of 80,000 spectators and in a duet with fellow rapper Snoop Dog, who interacted with Tupac's hologram on stage.[228]

Two years later, Michael Jackson's virtual reincarnation appeared at the Billboard Music Awards, standing out for its resemblance and convincingly expressive gestures. In 2015, Billie Holiday, who died in 1959, sang at the Apollo Theater in New York.[229] Roy Orbison went on an international tour in 2018, 30 years after his death. In Europe alone, he sold 38,000 tickets for a 65-minute show in which he sang 16 of his best-known hits, accompanied by a live orchestra.[230] Maria Callas was holographically brought back to life in the same year: "When this 'Holo-Callas' took the stage, it was light-years away from the danger zone of the uncanny valley. It had a strong physical likeness and convincingly expressive gestures with realistic, graceful movements."[231] Other musicians who have found a second holographic career include Nat King Cole, Liberace, Buddy Holly, Freddie Mercury, and Frank Zappa:

"For what it's worth, the crowd at the Zappa concert seemed utterly charmed—cheering when the hologram Zappa materialized in the center of the stage during the opening number, *Cosmik Debris*. I was sitting about eight rows from the front. It looked like Zappa up there, more or less, though his form radiated the paranormal brightness that holograms can't help emitting." [232]

228 Dodson, Aaron: "The Strange Legacy of Tupac's 'Hologram' Lives on Five Years after Its Historic Coachella Debut," *the undefeated.com*, April 14, 2014, https://theundefeated.com/features/the-strange-legacy-of-tupacs-hologram-after-coachella/

229 Binelli, Mark: "Old Musicians Never Die. They Just Become Holograms," *New York Times Magazine*, January 7, 2020, https://www.nytimes.com/2020/01/07/magazine/hologram-musicians.html

230 Lee, Wendy: "Roy Orbison Hologram Concert in L.A.. Invites Awe and Debate," *Los Angeles Times*, October 6, 2018, https://www.latimes.com/business/hollywood/la-fi-ct-orbison-hologram-20181006-story.html

231 Selinger, Evan: "Why I Won't Clap for a Hologram," *Medium.com*, November 29, 2018, https://onezero.medium.com/why-i-wont-clap-for-a-hologram-705cd2e9cef4

232 M. Binelli: "Old Musicians Never Die. They Just Become Holograms."

The enhancement of traditional analog holographic processes is achieved through their fusion with digital image processing and real-time video generation practices developed in the film and games industry, as well as with augmented and virtual reality techniques. Usually, a body double records the stage act via performance capture. Animators use this motion data to create a three-dimensional digital model and add the deceased artist's facial features and physical characteristics. Finally, the holographic image data and existing vocal recordings are lip-synchronized.

The 3D stage projection of the virtually resurrected artists employs a digital upgrade of the "Pepper's Ghost" effect, which was initially developed during the mid-19th century. In its analog version, the mirror image of an actor hidden under the stage was projected onto a pane of glass installed between the stage action and the auditorium. This enabled the actors on stage to interact with ghostly apparitions that seemed to appear to the audience 'out of nowhere.' Current productions of the effect employ elaborate configurations of both analog and digital 2D and 3D equipment, particularly laser projections on novel transparent materials such as Mylar. In combination, this hybrid form of holography creates a lifelike stage presence of absentees.

However, unlike pure holograms, these holo-projections do not produce 360-degree images that can be circled like sculptures. Instead, the projected images resemble analog reliefs: a 180-degree view of the object appears on the invisible projection surface. The digital characters show realistic depth and plasticity—as long as they are viewed from the front. Only simple pre-planned interactions with living actors or the audience are possible to date, as the resurrected artists' image data must still be pre-produced. The further development of the technology aims to ensure that "a puppeteer sitting in the wings with a laptop could work the digital strings live—allowing the hologram to react to the crowd or to members of a live band."[233] With this, and in the next step by replacing human remote control with artificial intelligence, Holodeck-like 'live' stage events with deceased or absent actors or artists should be possible.

Since 2013, the time capsule project "New Dimensions in Testimony" at the University of Southern California in Los Angeles has been undertaking a variant of these resurrections based on 360-degree holography instead of relief projections. In collaboration with the Illinois Holocaust Museum and Education Center, it produces holographic recordings of Holocaust survivors.[234] In a green-screen

233 Ibid.

234 N.N.: "Dimensions in Testimony," *USC Shoah Foundation*, accessed June 16, 2024, https://sfi.usc.edu/dit

environment, they answer around 1000 questions on various aspects of their lives and experiences. The testimonies are stored in an audiovisual database. When visitors ask their questions in the future, the database will generate the most suitable holographic responses. The objective is to facilitate lifelike discourse and interactive engagement with the Holocaust survivors in a manner analogous to the simulated Holodeck debates between STAR TREK officers and historical figures.

The third approach to making some elements of the utopian Holodeck a reality in the present is through practical research into Virtual Reality. Concerning the Holodeck, this effort can be considered a misunderstanding or displacement in the sense of Freud's interpretation of dreams.[235] The Holodeck is characterized by its fictional worlds and characters having a material form. They can, therefore, be seen with the naked eye—like holographs—and felt with bare hands. However, VR, popularized in the late 1980s at about the same time as the Holodeck, lacks these essential characteristics. It requires 3D glasses and generates audiovisions that are not tangible. Nevertheless, the VR community immediately adopted the media utopia of the Holodeck.

"Michael Heim [...] states that at the specialist conferences of the 'Special Interest Group on Graphics and Interactive Techniques' in 1989 and 1990—at which virtual reality was discussed in detail for the first time—the Holodeck was one of the guiding principles that served as an incentive for virtual reality researchers. A technology and design manual on virtual reality from 1993 quite naturally names the Holodeck as the 'ultimate goal' of research [...]—the Holodeck becomes the center of the central imaginary of this research."[236]

Over the 35 years that have passed since then, numerous pioneering VR research projects—initiated by leading universities and large corporations alike—have been launched under the guiding principle of the Holodeck. Five projects stand out in particular. In 2011, Stevie Bathiche, research director of Microsoft's Edison Lab, stated that the lab strives "to create a holodeck-like experience."[237] Since 2012, another "Project Holodeck" at the School of Cinematic Arts at the University of Southern California in Los Angeles has been using the Oculus Rift visor to

235 The displacement phenomenon occurs when the essential contents of dream thoughts are replaced in the dream by other elements that have a superficial or accidental association with them.

236 C. Ernst/J. Schröter: *Media Futures: Theory and Aesthetics*, pp. 88-89.

237 Sottek, T. C.: "To Build a Holodeck: An Exclusive Look at Microsoft's Edison Lab," *The Verge*, December 29, 2011, http://www.theverge.com/2011/12/28/2665794/microsoft-edison-lab-holodeck-tour

experiment with interactive-immersive audiovisual experiences.[238] In March 2013, Jeff Norris from NASA's Jet Propulsion Laboratory announced at the Game Developer Conference in San Francisco that the space agency is planning to allow millions of earthlings to experience space travel via an illusionistic system "of shared immersive exploration. Everyone exploring the universe through robotic avatars, not just peering at numbers or pictures on a screen, but stepping inside a holodeck and standing on those distant worlds."[239] In 2017, the chip company Nvidia named its "intelligent virtual reality platform" Holodeck.[240] Additionally, in 2018, Gene Roddenberry's son Rod experimented with holographic displays to get closer to the Holodeck: "I want to see Star Trek's technologies made real, and for the very first time, now believe that a real Holodeck is no longer limited to science fiction."[241]

The insight that interpreting the Holodeck as a utopia pointing to the emerging medium of VR is a misinterpretation—or a displacement in the dreams of those working in the field of VR—is most clearly demonstrated by a billion-dollar deal closed intending to change the future of media. In 2009, Palmer Luckey, 17 years old, began assembling goggles from standard electronic components in his parents' garage. His goal was to make VR affordable for games.[242] The history of virtual reality changed when Luckey received an email from John McCormack four years later. The legendary co-creator of FPS games such as DOOM and QUAKE had heard about Luckey's experiments and wanted to purchase a prototype:

238 Stevens, Tim: "Project Holodeck and Oculus Rift hope to kickstart every gamers' VR dream for $500," *Engadget*, July 23, 2012, http://www.engadget.com/2012/07/23/project-holodeck-and-oculus-rift/

239 Claiborn, Samuel: "NASA Wants to Design a Holodeck. At GDC 2013, NASA presentation claims 'We are the Space Invaders'," *IGN*, 2013, http://www.ign.com/articles/2013/03/28/nasa-wants-to-design-a-holodeck

240 Etherington, Darrell: "Nvidia Built a Real Holodeck, Aimed at Creative Collaboration," *Techcrunch.com*, October 10, 2017, https://techcrunch.com/2017/10/10/nvidia-built-a-real-holodeck-aimed-at-creative-collaboration/

241 N.N.: "Roddenberry Entertainment Joins Project To Build Real Star Trek-like Holodeck," October 23, 2018, https://trekmovie.com/2018/10/23/roddenberry-entertainment-joins-project-to-build-real-star-trek-like-holodeck/

242 Kushner, David: "Oculus Rift Takes Virtual Reality Mainstream," *IEEE Spectrum*, December 31, 2013, https://spectrum.ieee.org/oculus-rift-takes-virtual-reality-mainstream

"Carmack had been fascinated by virtual reality since seeing the Holodeck on STAR TREK: THE NEXT GENERATION as a teen, and he had been chipping away for decades at the technology needed for VR as he helped create Id's first-person shooter games."[243]

Luckey's prototype impressed McCormack, and he presented the Oculus Rift goggles at the Electronic Entertainment Expo (E3) in Los Angeles in 2012:

"One popular game site heralded that the 'Rift could be the closest we've come to STAR TREK's Holodeck' and another describing it as 'a gaming experience with a level of immersion genuinely unlike anything else we have ever encountered.'"[244]

The subsequent Kickstarter campaign raised almost ten times the 250,000 dollars requested. Just two years later, Palmer Luckey sold his company to Mark Zuckerberg for two billion dollars in cash and stocks. However, the founder of Facebook did not acquire Oculus because he wanted to build the Holodeck. Like a professional psychoanalyst, he had decoded the dreamy displacement of Holodeck fans: Zuckerberg recognized VR as the foundational technology of another future medium—one he longed to make a reality.

In 2022, Facebook renamed itself Meta, underlining its focus on the Metaverse.

EPILOG: THE METAVERSE

Neal Stephenson's vision of the Metaverse responded to the state of digital technology around 1990. By then, digital networking had made little progress compared to the time *Neuromancer* was written. The number of Americans utilizing the Internet and other proprietary online services, namely CompuServe, America Online, and Prodigy, was relatively limited, with only a few million users. The largest provider, CompuServe, for instance, had approximately 600,000 subscribers.[245] Worldwide, less than 0.5% of people were online, i.e., 26.5 million out of 5.3 billion.[246] Few anticipated any significant changes of this situation in the near

243 Ibid.

244 Ibid.

245 N.N.: "CompuServe Interactive Services, Inc.," *Company-Histories.com*, https://www.company-histories.com/CompuServe-Interactive-Services-Inc-Company-History.html

246 Roser, Max: "The Internet's History Has Just Begun," *OurWorldInData.org*, October 3, 2018, https://ourworldindata.org/internet-history-just-begun

future. The US government controlled the Internet, and access was largely restricted to scholars, students, and the military. In contrast, the future of virtual reality looked more promising, as it seemed to offer the potential for more comprehensive public access and diverse applications.

1 From the Ultimate Display to Virtual Reality: Origins of the Metaverse

The history of virtual reality—like that of digital networking and holography—began in literature. In the early 20th century, E.M. Forster's short story "The Machine Stops" sketched a world in which telepresence and telecommunications had replaced all direct human encounters—a reality in which experiences were almost exclusively media-mediated.[247] A quarter of a century later, Stanley G. Weinbaum wrote a short story, "Pygmalion's Spectacles," which revolves around futuristic 3D goggles.[248] They facilitate a hyper-immersive experience of audiovisuals by not only projecting their images in 3D but also enabling users to engage with the action in a multisensory manner. Subsequently, the advances in digital simulation technology were reflected in science fiction literature from the mid-1960s onwards, for example, in Philip K. Dick's *Simulacra*[249] and Daniel F. Galouye's *Simulacron-3*.[250] Both novels, published in 1964, describe the creation of simulated people and worlds for various sinister purposes.

One year later, Ivan Sutherland, then a professor at Harvard, presented a radical theoretical concept—the "ultimate display":

> "The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. […] With appropriate programming such a display could literally be the Wonderland into which Alice walked."[251]

247 Forster, Edward Morgan: "The Machine Stops," *The Oxford and Cambridge Review*, November 1909, https://www.gutenberg.org/cache/epub/72890/pg72890-images.html#THE_MACHINE_STOPS

248 Weinbaum, Stanley Grauman: "Pygmalion's Spectacles," *Wonder*, June 1935, https://www.gutenberg.org/files/22893/22893-h/22893-h.htm

249 Dick, Philip K.: *The Simulacra*, New York, NY: Vintage Books 2002 [*1964].

250 Galouye, Daniel F.: *Simulacron-3*, New York, NY: Bantam Books 1964.

251 Sutherland, Ivan Edward: "The Ultimate Display," in: Randall Packer/Ken Jordan (eds.), *Multimedia: From Wagner to Virtual Reality*, New York, NY: Norton 2001 [*1965], pp. 232-236.

Sutherland's concept foreshadows the hypothetical yet scientifically conceivable matter hologram, which Gene Dolgoff will propose a few years later. In his practical work, however, Sutherland did not pursue the idea of a material image space with a visuality that could be experienced haptically any further and instead replaced it with the equally innovative concept of the head-mounted display (HMD). He demonstrated the prototype in 1968, a cumbersome contraption nicknamed "The Sword of Damocles," the great grandfather of today's VR goggles.[252] What could not yet be realized as a room thus became a virtual space for privatized perception. In parallel, Sutherland and his team programmed a scene generator, the great grandfather of game engines, that allowed the interactive generation of computer graphics for flight simulations.[253] With these three innovations—the concept of the Ultimate Display as not a window but a room, the HMD as a virtual simulation of such a room, and the Scene Generator as the software program to create immersive interactive visuals—Ivan Sutherland, in the latter half of the 1960s, laid the foundations for what we now call Virtual Reality.

Sutherland's experiments led in the 1970s and 1980s to the "Visually Coupled Airborne Simulator," produced for the US Air Force. These HMDs cost about $1 million apiece and seemed so futuristic that—in the times of the first STAR WARS movies and the *Strategic Defense Initiative*, which was derisively nicknamed "Star Wars" as well—they were referred to as "Darth Vader helmets."[254] By the mid-1980s, however, the technology had become considerably cheaper due to a NASA project that used prefabricated parts. Its goal was to build simulation systems that could be navigated and manipulated interactively but independently of specific hardware.

At this point, Jaron Lanier entered the scene. The young artist earned his living by designing video games, including the successful music game MOONDUST for

252 Sutherland, Ivan Edward: "A Head-Mounted Three Dimensional Display," *AFIPS '68 (Fall, part I): Proceedings of the December 9-11, 1968, Fall Joint Computer Conference, part I*, 1968, pp. 757-764, https://www.cise.ufl.edu/research/lok/teaching/ves07/papers/sutherland-headmount.pdf

253 Rolfe, J. M./K. J. Staples: *Flight Simulation*, Cambridge [Cambridgeshire]; New York. NY: Cambridge University Press 1986, p. 234.

254 Bye, Ken: "50 years of VR with Tom Furness: The Super Cockpit, Virtual Retinal Display, HIT Lab, & Virtual World Society," *Voices of VR Podcast*, November 17, 2015, https://voicesofvr.com/245-50-years-of-vr-with-tom-furness-the-super-cockpit-virtual-retinal-display-hit-lab-virtual-world-society/

the Commodore 64.[255] Simultaneously, he was experimenting with technologies referred to as virtual environments (VE). Lanier recognized that NASA's approach marked a transition from 'specialized simulations' such as flight or driving simulations with specific hardware—particular cockpits, and so forth—to 'universal simulations,' in other words, to simulation apparatuses that are as universal as the digital computer is a universal machine. For such software-based simulation environments, which partially realized Sutherland's concept of the ultimate display, Jaron Lanier coined a new term: Virtual Reality.[256]

In 1987, VPL Research, the company Jaron Lanier founded, developed the first universal simulation machine as a commercial product, the $250,000 EyePhone. This system consisted of a Macintosh computer serving as the control system and two Silicon Graphics workstations, each calculating the virtual worlds at 30 frames per second for one eye. The head-mounted display had built-in stereo speakers and two LCD monitors that produced stereoscopic 3D images. A data glove or a full-body DataSuit completed the hardware setup. The core of the EyePhone was its proprietary software, capable of dynamically executing a variety of simulations—from flights to architecture to games—all using the same hardware.[257]

Consequently, Lanier considered VR "the dawn of a new era, like when Columbus returned to Spain with news of the New World. Only this time, the New World is infinite; it's the virtual world, still largely uninvented and unexplored."[258]

Far-reaching hopes like these were widespread in the early 1990s when VR enjoyed its first boom phase, though it was still expensive and somewhat primitive. The title of Howard Rheingold's classic 1991 reportage captured the spirit of optimism sparked by the new medium: *Virtual Reality: The Revolutionary Technology of Computer-Generated Artificial Worlds—And How it Promises and Threatens to Transform Business and Society*.[259]

255 MOONDUST (Creative Software Inc. 1983, O: Lanier, Jaron).

256 Steuer, Jonathan: "Defining Virtual Reality: Dimensions Determining Telepresence," *Journal of Communication* 42, no. 4 (1992), pp. 73-93, here p. 73, https://steinhardtapps.es.its.nyu.edu/create/courses/2015/reading/steuer.pdf

257 Sorene, Paul: "Jaron Lanier's EyePhone: Head and Glove Virtual Reality in the 1980s," *flashbak*, November 24, 2014, https://flashbak.com/jaron-laniers-eyephone-head-and-glove-virtual-reality-in-the-1980s-26180/

258 Scheinin, Richard: "Through the Looking Glass: 'Virtual Realities' Can Take Us Into Other Worlds," *Chicago Tribune*, February 18, 1990.

259 Rheingold, Howard: *Virtual Reality*, New York, NY: Summit Books 1991.

2 From Cities to Worlds: Metaverse's Aftereffects

At the dawn of the 1990s, the future of VR seemed more promising than that of the Internet—but this popular assessment soon turned out to be wrong. The new audiovisual medium of VR, which still featured prominently as a sensation in the evening news in 1990,[260] no longer seemed worth reporting in 2000. The Internet, on the other hand, exceeded all expectations and grew explosively. Its infrastructural expansion and popularization through the graphical hypertext mask of the World Wide Web led to strong growth. The global online population increased from 0.5% in 1990 to 7% in 2000, representing a growth from 26.5 million to 430 million individuals.[261] Of course, there were major global differences, even between the developed nations. In 2001, 55% of all adults in the US were using the Internet, and in Germany, only 37%.[262] At the same time, the usage of VR was limited to certain industries and early adopters, and it was so low that it couldn't be tracked statistically.

Around 1990, however, Stephenson was not the only one to propose a future medium that combined networking and computer graphics, with the graphics being the spectacular focus. A few months before *Snow Crash* introduced the Metaverse, David Gelernter published *Mirror Worlds, Or, The Day Software Puts the Universe in a Shoebox*.[263] In his monograph, the influential computer scientist speculated on the feasibility of software worlds mirroring reality and affording the control of material processes via interaction with their software representations. Consequently, a mirror world would have to not only replicate the appearance of buildings or objects in the real world but also provide additional advanced prop-

260 Cf., for example, ABC PRIMETIME LIVE (USA 1991, D: N.N.). Online: https://www.youtube.com/watch?v=rVn3H93Ysag

261 World Bank Group: "Individuals Using the Internet," *data.worldbank.org*, n.d., https://data.worldbank.org/indicator/IT.NET.USER.ZS?end=2022&most_recent_value_desc=false&start=1960&view=chart

262 For the US, see Perrin, Andrew and Maeve Duggan: "Americans' Internet Access: 2000-2015," *Pew Research Center*, June 26, 2015, https://www.pewresearch.org/internet/2015/06/26/americans-internet-access-2000-2015/. For Germany, see Davis, Kasia: "Share of Internet Users in Germany from 2001 to 2023," *Statista*, April 24, 2024, https://www.statista.com/statistics/380514/internet-usage-rate-germany/

263 Gelernter, David Hillel: *Mirror Worlds, Or, the Day Software Puts the Universe in a Shoebox—: How It Will Happen and What It Will Mean*, New York: Oxford University Press 1991.

erties and functions. Gelernter's proposal evidently anticipated the early 21st-century concept of the digital twin, which is now a relatively common practice associated with efforts to create a Metaverse.[264]

The scientific proposal of virtual mirror worlds and the science fiction vision of a Metaverse are linked both historically and in their objectives. Both extend two key technological achievements of the early digital age into the future —the Internet and computer graphics, i.e., Virtual Reality. Both predict an integration of hardware reality and software virtuality and, for virtual visualization, refer to modes of representation called skeuomorphism in design theory: the imitation of physical elements in software to make virtual tools or worlds more familiar and easier to understand for users.

The rapid settlement of the WWW, which commenced after the 1993 release of the first browser displaying text and graphics in one window, followed a similar skeuomorphic principle. Simple graphical impressions of modern cities and software equivalents of their services and functionalities filled the abstract emptiness of the data space. An outstanding non-commercial example of transforming real structures into virtuality was the Digital City of Amsterdam (De Digitale Stad, DDS). Its opening on January 15, 1994, marked the beginning of the success story of cities made of bits and bytes. DDS quickly grew into a large habitat with more than 140,000 "inhabitants" and inspired other digital cities such as Berlin or the art project *Telepolis*, which later mutated into Germany's leading online magazine.[265] Its name combines the Greek words "tele," i.e., at a distance, and "polis," i.e., city, and thus means "distant city," like telephone means distant sound. The most elaborate and expensive project of this kind, however, was Apple's eWorld. The online world launched in June 1994 as a subscription-based information service for Mac and Newton users. eWorld used a city metaphor for its user interface, with each building representing a software function, including a post office housing the e-mail inbox, a newsstand storing electronic magazines, and so on.[266]

Gert Lovink criticized this skeuomorphism in 1997 as "regressive": "There are still no metaphors that come from the technology and the network itself."[267] In

264 For an introduction, see N.N.: "What Is a Digital Twin?," *Unity*, 2022, https://unity.com/solutions/digital-twin-definition#history-digital-twin-technology

265 See Wiktorin, Dorothea/ Vossen, Joachim: "Virtuelle Stadt–die neue globale Stadt. Auf dem Weg zur CyberCity," *Praxis Geographie* 31 (2001), pp. 12-16.

266 Dormehl, Luke: "Today in Apple History: eWorld Closes Its Virtual Doors," *Cult of Mac*, March 9, 2024, https://www.cultofmac.com/470461/today-in-apple-history-eworld-closes-its-virtual-doors/

267 Quoted from D. Wiktorin/J. Vossen: "Virtuelle Stadt." (My translation.)

contrast, Zina Moukheiber recognized the parallels between virtual cities and Stephenson's "The Street" and thus the process of civilizing Cyberspace's wild *frontier* into a metaversal counter-world:

"What we ended up with is more like a fully realized city, with virtual homes, businesses, libraries, nightclubs—even a red light district. It is closer, in other words, to another science fiction vision, the 'metaverse' Neal Stephenson envisioned in his 1992 *Crash*. That particular moniker has not caught on, but many of Stephenson's ideas about what the on-line world can look like are driving a new generation of entrepreneurs to try to match it."[268]

The pivotal event for the transformation of the WWW into a boomtown—the kick-off for the so-called new economy—was Netscape's spectacular IPO in early August 1995. "Reading the newspaper accounts and watching the television news," wrote Paul E. Ceruzzi in 1998, "had the feeling that the day Netscape went public marked the beginning of the history of computing, and that everything else been a prologue."[269] At the time, I experienced the transformation of WWW as the opening up and normalization of the data space previously belonging to the happy few:

"Supermalls, theme parks, gamblers' paradises, and sex centers are springing up. Meanwhile, there's hardly anything that can't be found online: steaks and tax advice, live psychotherapy and investment help from neural networks, strip shows, and web soaps with characters you can interact with. In short, it is all kinds of wet dreams and brilliant business opportunities. Cyberspace is booming and changing radically. From Utopia to Las Vegas, so to speak, from irresponsible fun to organized pleasure, from a free space for minorities, outsiders, and the clairvoyant to a regulated playground and funfair for the average consumer. [...] Now the millions are joining the avant-gardes, and with them, the fence-pullers, levelers, businessmen, and lawmakers are encroaching."[270]

Deliberate efforts to create the dystopian-utopian Metaverse started in digital games and game-like digital environments. Online 3D worlds with meeting

268 Z. Moukheiber: "The Geeks Have Inherited the Earth."

269 Ceruzzi, Paul E.: *A History of Modern Computing*, Cambridge, MA: MIT Press 1998, p. 304.

270 Freyermuth, Gundolf S.: "Von Utopia bis Vegas," *Tagesspiegel*, November 23, 1997. (My translation.)

places, stores, educational and entertainment offerings, and even their own currencies were developed. One of the first was CYBERTOWN in 1995,[271] and the most successful was SECOND LIFE.[272] It opened in 2003 and had almost 65 million users in 2021. Parallel, online games evolved into proto-Metaverses, rivaling in revenue Las Vegas casinos. WORLD OF WARCRAFT, for example, attracted at its peak in 2017 up to 46 million monthly players and produced around $10 billion in revenue.[273] Other successful 3D game worlds include the online "experience" platform ROBLOX, with 500 million downloads and almost 200 million monthly users,[274] and FORTNITE (2017), with over 650 million registered users and 230 million active monthly players.[275]

One element indicating the transition from game worlds to social worlds for two decades was the evolution of complete economic systems in games, especially MMORPGs (massively multiplayer online role-playing games). In addition to the fee-based gaming itself, a multitude of other economic activities have arisen over the years: Avatars require clothing and equipment, land and real estate are acquired, and lively trade is conducted on virtual marketplaces. These increasingly complex economic systems have been able to compete in terms of value with the economies of smaller nations for a quarter of a century. An early example is the kingdom of Norrath in the game EVERQUEST. Edward Castronova noted back in 1999 that if Norrath were an actual nation, it would be one of the more prosperous

271 CYBERTOWN (IVN 1995, O: Hawk, S. F. X.); see Robertson, Adi: "When the Virtual City of Cybertown Went Dark, Its Citizens Rebuilt It," *The Verge*, April, 2022, https://www.theverge.com/23032658/cybertown-revival-blaxxun-virtual-community-rebuilding-project

272 SECOND LIFE (Linden Lab 2003, O: Rosedale, Philip); see Greener, Rory: "Second Life Storefront User Traffic Jumps 35 Percent in 2021," *XR Today*, January 12, 2022, https://www.xrtoday.com/virtual-reality/second-life-user-traffic-jumps-35-percent-in-2021/

273 WORLD OF WARCRAFT (Blizzard Entertainment 2004, O: Kaplan, Jeff; Pardo, Rob; Chilton, Tom); see Galov, Nick: "15 Facts About The WoW Player Count in 2022," *Web Tribunal*, April 6, 2022, https://webtribunal.net/blog/wow-player-count/#gref

274 ROBLOX (Roblox Corporation 2006, O: Roblox, Corporation); see Press, Gil: "How Many People Play Roblox–User and Growth Stats in 2024," *WhatsheBigData.com*, 2024, https://whatsthebigdata.com/roblox-users/

275 FORTNITE (Epic Games 2017, O: Epic Games, People Can Fly); see Adhikary, Ishan: "How Many People Are Playing Fortnite? (Player Count 2024)," *Beebom*, May 26, 2024, https://beebom.com/fortnite-player-count/

countries on the planet: "According to GNP data from the World Bank, Norrath is the 77th richest country in the world, roughly equal to Russia."[276]

Traditionally, real estate transactions are the cornerstone of online economies. In SECOND LIFE, virtual land, buildings, and other software objects changed hands for $3.2 billion between 2003 and 2013.[277] Since then, prices have tended to rise. In December 2021, a modest property fetched $450,000 because it was next to the mansion of legendary veteran rapper Snoop Dogg—albeit not in Hollywood, but THE SANDBOX.[278] The video game is based on blockchain technology and thus permanently secures the identity of the actors, the history of transactions, and the acquired property titles. Like THE SANDBOX, many other metaversal game worlds now have proprietary cryptocurrencies that are also traded on crypto exchanges outside the games. By acquiring actual purchasing power, virtual play money brings closer the vision at the heart of the Metaverse: a playful, simulative fusion of reality and virtuality.

Another indication of the formation of metaversal worlds is the growing number of individuals who utilize online games for purposes beyond gaming, such as social interaction, private meetings, and cultural events. They celebrate weddings and birthdays, hold graduation parties, and attend mass concerts by superstars like Ariana Grande, Lil Nas X, and Travis Scott, bringing together millions of participants.[279] FORTNITE hosted the "Short Nite" film festival, where players and their friends could watch 12 animated short films together on a big screen in the game.[280] MINECRAFT regularly organizes educational events that allow stu-

276 Castronova, Edward: "Virtual Worlds: A First-Hand Account of Market and Society on the Cyberian Frontier," *CESifo Working Paper Series* no. 618 (December, 2001), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=294828

277 Jamison, Leslie: "The Digital Ruins of a Forgotten Future," *The Atlantic*, December 2017, https://www.theatlantic.com/magazine/archive/2017/12/second-life-leslie-jamison/544149/

278 Hayward, Andrew: "What is the Metaverse? The Immersive, NFT-Powered Future Internet," *Decrypt*, February 17, 2022, https://decrypt.co/resources/what-is-the-metaverse-immersive-nft-virtual-worldsnoo

279 Ariana Grande achieved a viewership of 27 million in FORTNITE, Lil Nas X garnered 37 million in ROBLOX, and Travis Scott holds the record with a viewership of 45.8 million in FORTNITE (Patel, Justin: "Top 10 Most Popular Metaverse Concerts," *Metaverse Marcom*, November 18, 2022, https://www.metaversemarcom.io/).

280 The Fortnite Team: "Gather for the Short Nite Film Festival: Watch Film Shorts in Fortnite's Party Royale," *Fortnite*, February 16, 2021, https://www.fortnite.com/news/gather-for-the-short-nite-film-festival-watch-film-shorts-in-fortnites-party-royale

dents and teachers to create and use interactive learning environments.[281] Game designers largely succeed in achieving what many professional software engineers fail to do: they create online worlds where people want to spend time, unlike in Zoom rooms, where users often leave as quickly as possible. With their playful fusion of reality and data space, digital games seem to prefigure effects associated with a future Metaverse.

However, the aspiration to realize the Metaverse has long since left the "magic circle" of digital games. The last decade has seen a breakthrough or transfer from gaming to the industrial sphere. High-tech and media companies such as Meta and Microsoft have invested billions to make the imaginary Metaverse a media reality. Around 2020, a phase of heated hype revealed how these corporations envision their commercial update of Neal Stephenson's imaginary medium. Technologically, it is to be based on dramatically faster stationary and mobile networking (fiber optic networks, 5G). Its audiovisual worlds are to combine today's advanced (media) technologies, including virtual and augmented realities, artificial intelligence, and blockchain applications such as cryptocurrencies and Decentralized Finance (DeFi).

Nevertheless, most attempts to implement this have encountered significant challenges. Meta's Horizon Workrooms combine VR and web technologies, integrating mixed reality desk and keyboard tracking, hand tracking, remote desktop streaming, and spatial audio to deliver an immersive work experience.[282] Despite all these efforts, user numbers remained low. As success is not forthcoming—at least not immediately—game expertise is being purchased. For example, Microsoft acquired gaming corporation Activision Blizzard for 68.7 billion dollars at the beginning of 2022 to position itself for an industrial Metaverse.[283]

The objective is a complete fusion of reality and virtuality, particularly of real and virtual economies. The activities in these increasingly hyperrealistic software simulations are intended to be linked with those in physical reality to form an

281 N.N.: "Hold a Digital Event in Minecraft," *Minecraft Education*, 2024, https://educommunity.minecraft.net/hc/en-us/articles/360047556851-Hold-a-Digital-Event-in-Minecraft

282 N.N.: "Introducing Horizon Workrooms: Remote Collaboration Reimagined," *Meta Newsroom*, August 19, 2021, https://about.fb.com/news/2021/08/introducing-horizon-workrooms-remote-collaboration-reimagined/

283 Dinsdale, Ryan: "The Microsoft Activision Blizzard Deal: A Complete Timeline of Events," October 13, 2023, https://www.ign.com/articles/the-microsoft-activision-blizzard-deal-a-complete-timeline-of-events

unprecedented unity. In this respect, the ambitions of the digital Metaverse coincide with those of the analog Total Work of Art. Its 19th-century proponents already called not only for transmediality or, in the terminology of their time, the fusion of all the arts. They also wanted to overcome the separation of medium and reality or, in the terminology of their time, the fusion of art and life. Neither of these ambitions could be realized under analog conditions. The Metaverse's evangelists are currently promoting a new attempt at a higher technological level.

The Medialization of Everyday Life. A Summary

The results of this investigation permit the formulation of three conclusions.

Firstly, all three imaginary media—Cyberspace, Holodeck, and Metaverse—reflect the continuous penetration of digital technology into work and entertainment during the transition from an industrial to a digital culture. Culturally, the three visions of future media took on the role of models to emulate, even if their inventors had not necessarily intended them to be entirely positive. The triad profoundly influenced practitioners and theoreticians alike—with a delay of a decade in each case. Cyberspace became a buzzword in the early 1990s, accompanying the rise of the World Wide Web and prefiguring the cultural understanding of digital networking. The fear and fascination of Cyberspace probably most strongly impacted film during its transition from analog to digital production and distribution. The Holodeck has served as a model for the exploration and experimental use of holography and virtual reality since the late 1990s, as well as for the discussion and creation of digital narratives. The Metaverse finally came to the fore in the early 2000s when computer graphics achieved audiovisual hyperrealism, and, above all, participation in online experiences became familiar with the so-called Web 2.0 or social web. As a concept, Stephenson's Metaverse still guides the development of networked online worlds for playful entertainment and, ultimately, work and business.

Secondly, a relationship can be observed between the three imaginary media. This relationship is dialectical and follows the structure of thesis, antithesis, and synthesis. In 1982, William Gibson put forward the thesis: a networked mental world, which he described two years later in his novel *Neuromancer* as a "consensual hallucination." As such, Cyberspace imagined a counter-reality that affords individuals global immaterial communication and interaction. Gibson's future medium reflected and extended the state of digital networking in the early 1980s, shortly before the establishment of the Internet.

Five years later, in 1989, Gene Roddenberry presented the antithesis in the television series STAR TREK: THE NEXT GENERATION. The Holodeck contrasts the

immateriality of global Cyberspace with a non-networked and thus locally limited but materially tangible experience. Users can physically interact with Holodeck's solidly simulated environments and characters as they would in the real world. Roddenberry's future medium reflected and "materialized" the playful and narrative hopes associated with the new audiovisual media of holography and computer graphics in the mid-1980s.

Another five years later, Neal Stephenson produced the synthesis in his novel *Snow Crash*. His Metaverse envisioned a globally networked, persistent virtual counterworld accessible to avatars. i.e., virtual representations of users. In the early 1990s, at the zenith of VR's inaugural surge and shortly before the introduction of the World Wide Web, Stephenson combined the effects of Cyberspace's immaterial networking with the graphic simulation of material reality's three-dimensionality as afforded by the Holodeck. The precondition for Stephenson's synthesis is a higher level of abstraction and its technical implementation: the disembodiment of the users. Only the medialization of their humanity allows for their entry into the Metaverse.

Thirdly, these three imaginary media indicate the historical transition from the scarcity and costliness of entertainment and information, which prevailed in almost the entire analog era, to their digital abundance and affordability up to being free of charge. This change initiates new ways of using audiovisual media. For thousands of years, the basic model was the attendance of individual performances in semi-public spaces, in the theater, at the opera, and in the cinema. This type of use provides a temporary respite from the demands of everyday reality. A second type of use developed in the first half of the 20th century with broadcast media. Radio and television invade the domestic space and overlay everyday life for large parts of the day, but without completely displacing material reality. The cohabitation of media and everyday life and work supplements and partially replaces visits to the theater or cinema. The time spent engaging with media is increasing.

Finally, Cyberspace, Holodeck, and Metaverse introduce and encourage a third type of use, which, only a few years later, becomes a real possibility: the transition from shorter or longer but always intermittent and transient engagement with single media works to comprehensive and enduring immersion in media worlds. These environments no longer serve solely as entertainment, compensating for the prose and deprivations of everyday life. They increasingly function as platforms for gainful employment and professional value creation. The Metaverse thus strives to take over not only the functions of heterotopias such as theaters and cinemas, which provide a temporary escape from reality for recreation and entertainment but also aims to become the new workplace as well as the new living

room—a ubiquitous virtual environment in which all actions leave data traces readable by artificial intelligence.

The first type of reception necessitates the audience to visit a venue. In the second type, the media integrate into the audience's home environment, effectively moving in with them. In the third type, the audience—or rather, the users—immerse themselves in the media, effectively moving into the media.

In this regard, the Metaverse, should it become a reality on the scale of the WWW, would be a meta-medium. David Chalmers posits the emergence of a "Reality+": online VR worlds in which we can lead "a fully meaningful life."[284] The Metaverse thus entails an existential promise about the future—or an existential threat. In any case, it raises "ultimate questions" requiring new metaphysics.

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284 Chalmers, David John: *Reality+: Virtual Worlds and the Problems of Philosophy*, New York, NY: W. W. Norton & Company (Kindle Edition) 2022, loc. 162.

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