UNIVERSITY OF CALIFORNIA SAN DIEGO

Learning to Live With Ghosts:
Holopresence and the Historical Emergence of Real Virtuality Technologies

A dissertation submitted in partial satisfaction of the requirements for the degree
Doctor of Philosophy

in

Communication (Science Studies)

by

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The Dissertation of Thomas H. Conner is approved, and it is acceptable in quality and form for publication on microfilm and electronically.

University of California San Diego

2021

DEDICATION

To my father, LLCJR, LL.B. — for whom love was never a matter of degrees.

To my husband, Daniel — ever-patient and, thankfully, ever-present.

EPIGRAPH

That which has no substance
enters where there is no space.
— *Tao te Ching, stanza 43*

O Ghost, O Lost, Lost and Gone,
O Ghost, come back again.
— *Hunter S. Thompson*

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ABSTRACT OF THE DISSERTATION

Learning to Live With Ghosts:
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Professor David Serlin, Chair

This dissertation is a media-archaeological inquiry into emergences of holograms, broadly defined, in order to demonstrate how human interaction with a specific style of technical imagery may be seen as a social negotiation of inherent contradictions that haunt ideologies of modernity — tensions between presence and absence, body and spirit, life and death. Throughout this work, I discuss what I have identified as visual forms of technically mediated mortality in order to situate these forms within relevant fields — namely, science and technology studies, media archaeology and media studies, and visual culture studies — and their varied but

networked examinations of human-machine social relations that have taken shape since the European Enlightenment.

My analysis is organized around the historical figures of the hologram and the "hologram," a bifurcated term with differing denotations but similar connotations. By following the transportation of the label from an object of science imagery to one of digital projection, this study traces emergences of dimensional, spectral imagery within situated contexts in which spectators not only wrestle with existential concerns but struggle to negotiate the immateriality of mediated experience. I examine four cases that may appear to be (and are often discussed as) apparatuses that are technically and phenomenologically distinct: the Pepper's Ghost stage illusion as developed by the Royal Polytechnic Institute in London in the mid-19th century, optical holograms displayed at the Museum of Holography in New York City during the 1970s, the imaginary of science-fiction "holograms" (as depicted mainly in *Star Wars* and *Star Trek*), and a posthumous performance by the rapper Tupac Shakur as a "hologram" at a live music festival in 2012. Each example demonstrates the emergence of a specific code of visual communication, which I refer to as the *technical image*, following from the work of communication philosopher Vilém Flusser. The hologram, in fact, projects forward the essence of Flusser's category by hailing a different kind of spectator (a holosubject), a mobile viewing body who might "read" imagery from a variety of subjective perspectives. By interacting with 3D image-bodies (reaching out to touch, and failing) the holosubject is hailed by the hologram as a fellow specter within a comingling of the virtual and the visceral — a novel mediated experience I call holopresence, the direct experience of a mixed space that includes the virtual space of the image. Rather than "entering" a separate virtual-reality space, holopresence is an encounter with virtuality amid the real — an interaction with real virtuality.

Introduction:
An emergent theory of holopresence

> We get accustomed
> to everything soon enough,
> even all these dead.
> — *Kevin Nance*

Early in Adolfo Bioy Casares' 1940 novella *La Invencion de Morel* (*The Invention of Morel*),[1] an unnamed fugitive escapes to a Polynesian island thought to be deserted. He finds himself, however, skulking around and spying on a group of visitors who seem to appear and disappear suddenly, as if by magic, performing repeated tasks. When the narrator begins to fall in love with one of the visitors, he reaches out to the object of his desire, but she is ungraspable, immaterial, spectral "as if I had almost touched a ghost." The fugitive questions the existence of his companions, wondering if "perhaps they are merely hallucinations," finally deciding that "these people are real — at least as real as I am." As he speculates on the nature of his own being and the status of his mortality — wondering if perhaps he himself is "some other dead man of another sort, at a different phase of his metamorphosis"[2] — he eventually considers the possibility that he may be a ghost among ghosts. A second sun then rises in the sky.

Over the course of the novella, Casares reveals that the island is a tomb, but also a laboratory, a complex technological experiment in which an extensive sensory and dimensional presence of a person is recorded and then played back with remarkable fidelity as animated, 3D renderings overlayed onto existing reality. A scientist named Morel (who may also be dead)

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[1] Adolfo Bioy Casares, *The Invention of Morel (La Invencion De Morel)*, trans. Ruth L.C. Simms (New York: New York Review, 1964/2003). Some translations of the novel add a subtitle, one that is richly relevant to this study: *The Image Machine (La Machine a Images)*.
[2] Ibid., 29, 22, 11, 52.

explains to the fugitive that he has been "inventing a way to put the presences of the dead together again" with the living, so that it might be "possible for all souls, both those that are intact and the ones whose elements have been dispersed, to have immortality"[3] — that is, living beings and projections of the dead interacting in the same space and time. Yesterday, a living woman may have walked a path underneath the sun. Today, a realistic specter of her, projected by a machine integrated into the island, walks the same path under the same suns even though the woman now may be dead.

Casares' concept — shocking, wild, and new, published 80 years ago — instills in the reader numerous uncanny experiences: the simultaneous fascination with and horror at the idea of the dead walking among the living, even if the dead are only presences projected into reality. In this dissertation, I will show that (long before the metaphors of *The Invention of Morel*) many of these same technological and conceptual conceits have been essential components of the modern media experience since the 19th century and are becoming more visible and accessible in the 21st. Specifically, this dissertation is a media-archaeological inquiry into emergences of holograms, broadly defined, in order to demonstrate how human interaction with a specific style of technical imagery may be seen as a social negotiation of inherent contradictions that haunt ideologies of modernity — tensions between presence and absence, body and spirit, life and death. Throughout this work, I discuss what I have identified as visual forms of technically mediated mortality in order to situate these forms within relevant fields — namely, science and technology studies, media archaeology and media studies, and visual culture studies — and their varied but networked examinations of human-machine social relations that have taken shape since the European Enlightenment.

[3] Ibid., 78.

In the following chapters, I organize my analysis around the historical figure of the hologram, a term that allows me to unite many different forms of technological innovation and mortality-related representation.[4] I examine four cases that may appear to be (and are often discussed as) apparatuses that are technically and phenomenologically distinct: the Pepper's Ghost stage illusion as developed by the Royal Polytechnic Institute in London in the mid-19th century, optical holograms displayed at the Museum of Holography in New York City during the 1970s, the imaginary of science-fiction "holograms" (as depicted mainly in *Star Wars* and *Star Trek*), and a posthumous performance by the rapper Tupac Shakur as a "hologram" at a live music festival in 2012. As I will argue throughout this dissertation, however, each example demonstrates the emergence of a specific code of visual communication, which I refer to as the *technical image*, following from the work of communication philosopher Vilém Flusser.[5]

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[4] A note about the word "hologram" and its contentious usage here: The tension between its two primary denotations has been a driver of this research project, which instead pursues their connotations. The word in its current form was coined in 1948 by physicist Dennis Gabor ("Microscopy by Reconstructed Wave-Fronts," *Proceedings of the Royal Society of London, Series A. Mathematrical and Physical Science* 197 (1949)), whose early theory was instrumental to the kind of 3D optical imagery examined in Chapter 2. He did not create the word out of thin air, as it were; rather, he adapted the word "holograph," which dates to the 1600s to refer to the authenticity of texts written "wholly by one's own hand" ("Holograph, Adj. & N.," in *OED Online* (Oxford Univ. Press, 2015)). This definition applied, largely in legal circles (e.g., a holographic will), until Gabor's coinage, which transferred the *holo-* prefix, meaning whole, from a signifier of written text (*-graph*) to one including visual representation (*-gram*) — aligning with Flusser's historical trajectory away from textual communication and toward technical images. Gabor's specific term later began to be used colloquially to refer to the science-fiction and digital imagery examined here in Chapters 3 and 4. Today, many first think of digital projections when they hear the word "hologram" (to the considerable dismay of optical holographers). Both Sean F. Johnston's science-studies (*Holographic Visions: A History of New Science* (Oxford: Oxford Univ. Press, 2006); *Holograms: A Cultural History* (Oxford: Oxford Univ. Press, 2016)) and Jens Schröter's media-studies (*3d: History, Theory and Aesthetics of the Transplane Image*, ed. Francisco J. Ricardo, trans. Brigitte Pichon and Dorian Rudnytsky, International Texts in Critical Media Aesthetics (New York & London: Bloomsbury, 2014)) accounts of holography's histories acknowledge that the term "hologram" has come to signify completely different technical objects, but neither explores with sufficient detail the cultural arenas in which this reapplication actually occurred, which my research here attempts to provide. In 2015, Dinesh Padiyar, with whom I served an internship at Triple Take Holographics, told me, "There's no need to apologise at the use of the word" to describe both optical and digital images (personal email communication, March 2, 1015). This dissertation is accordingly unapologetic; however, for historical and technical clarity, I will use punctuation throughout this study to distinguish between optical holograms and digital "holograms."

[5] See Vilém Flusser, *Towards a Philosophy of Photography* (Göttingen, West Germany: European Photography, 1984); Vilém Flusser, *Into the Universe of Technical Images*, ed. N. Katherine Hayles, Mark Poster, and Samuel Weber, trans. Nancy Ann Roth, Electronic Mediations (Minneapolis & London: Univ. of Minnesota Press, 2011); Vilém Flusser, *Into Immaterial Culture* (Metaflux, 2015).

According to Flusser, technical images include any imagery produced and projected by technical apparatuses (as opposed to directly by hand), from photos and film to TV and digital screens. Here, however, I situate holograms (especially the particular iterations of them explored here) as particularly potent extensions and enhancements of his technical image concept for the ways they attempt to situate their projected visuals within spatial and social positionings that are unique compared to the flat surfaces of traditional imagery and even media screens.

The holograms in this study share not only the added appearance of a third dimension to the imagery itself but the manifestation of that 3D image in a real rather than virtual space — seemingly or actually within the physical environment of their spectator. As noted by Casares' scientist Morel, "No screens or papers are needed; the projections can be received through space."[6] As 3D imagery, holograms are technical images that make more complex claims on spatial presence. Whether or not their spatiality is actual (as in the case of optical holograms) or simulated (as in the other three cases), these forceful claims on real vs. virtual spaces attempt to realize a social fantasy common among modern Western entertainment narratives.[7] In this sense, the hologram conforms to what Morel calls "a new kind of photograph."[8] Indeed, the character adds that "[u]ntil recently science had been able to satisfy only the senses of sight and hearing, to compensate for spatial and temporal absences," implying photos and film.[9] But even the

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[6] Casares, 70.

[7] The fluidity of real and virtual spaces is a common theme throughout fantasy and science-fiction narratives, from Proust's magic muffin in *In Search of Lost Time* (1913) to the more holopresent escapees from literature in Cornelia Funke's *Inkheart* (2005) to the materialized film character in Woody Allen's *The Purple Rose of Cairo* (1985) to the similarly connected real and filmic worlds in the Philip Glass opera *1,000 Airplanes on the Roof* (1988).

[8] Casares, 74.

[9] Ibid., 69. Morel's machine, like other scifi "holograms" to come, is more multimedia, as it were, by adding scent and touch to its embodied images. The cases in this dissertation still target primarily sight and sometimes hearing in the construction of their mediated presence, though as we will see in the realm of science fiction (Chapter 3) and in technologies in development and speculated within the near future (Conclusion) these experiences increase and decrease certain sensory inputs in an effort to broaden the material scope of their interactions. Though I am applying literatures that lean into a modern, ocularcentric visual experience, I am making every attempt to match the expanded dimension of my subjects with wider sensory analysis that includes the hologram's undeniable

experience of these mediated absences is limited by the separation created and maintained between a viewing subject and the virtual space represented *behind* the surface of the photo, the plane of the cinema screen, the pane of the digital "virtual window,"[10] each always upholding the distance of the mediation and managing a more ideal than material experience. This dissertation examines situations in which a chief function of the hologram-projecting apparatus is to dissolve a spectator's experience of those barriers and at least simulate the absence of screens in order to enhance the contextual presence of the mediated objects, scenes, and subjects.

Whereas photographs have been discussed as media objects that offer, as Roland Barthes has written, "a contact with death,"[11] my approach to holograms analyzes discourses about this "new kind of photograph" as presenting contact with some degree of life — an interaction with something that seems somehow more alive than a traditional image if not quite as alive as its spectators. The dimensionality and projection of holograms allows them to vie for greater spatial presence and even social agency than traditional images, ultimately winning increased parity of haunting presence and living being. Traditional portraits long have participated in manifesting

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"multimedia" experiences, especially those of sound and space. In the way W.J.T. Mitchell led cultural studies' "pictorial turn" into deeper consideration of the image as "a complex interplay between visuality, apparatus, institutions, bodies, and figurality" (*Picture Theory* (Chicago & London: Univ. of Chicago Press, 1994), 16) — or even, from another direction, the way performance-studies scholar Philip Auslander speaks to musicology with an insistence toward visuals and embodiment (see "Musical Persona: The Physical Performance of Popular Music," in *The Ashgate Research Companion to Popular Musicology*, ed. Derek B. Scott (Farnham & Burlington: Ashgate, 2009)) — I seek to bring certain elements of this complexity into focus, so that looking at a hologram may also involve recognizing its unique form of imagery but also positioning it within social encounters that hail much more than just a spectator's eye.

[10] I'm using this term in the sense of Leon Battista Alberti's concept of painting from the 15th century, particularly as resurfaced within Anne Friendberg's recent studies of digital screens, discussed further below; see Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge, Mass.: MIT Press, 2006) It is significant that Alberti's instructions for painters not only describes a specific positioning and view of the virtual space but ascribes to its practice a kind of resurrective magic: "a truly divine power, not only because, as they say of friendship, a painting lets the absent be present, but also because it shows [to] the living, after long centuries, the dead, so that [these] become recognized" (*On Painting: A New Translation and Critical Edition*, trans. Rocco Sinisgalli (New York: Cambridge Univ. Press, 2011), 44).

[11] Roland Barthes, *The Grain of the Voice: Interviews 1962-1980*, trans. Linda Coverdale (Evanston, Ill.: Northwestern Univ. Press, 1984), 356.

the presence of absent or dead figures[12]; sculpture, per Caroline van Eck's important study of the living presence of artwork, enhances an "oscillation between living beings … and works of art exercising the powers usually reserved for living beings," as if something like a person's "aura" were captured and replicated by the artwork[13]; photos and film affix and maintain, as André Bazin has claimed, some "fingerprint" of a person, so that an experience of the representations revives the presence of the represented (while, granted, perhaps reminding the spectator of their own mortality or, in terms of my argument, pre-existing spectrality).[14] Holograms also oscillate wildly between living presence and mediated imagery — between historical *aliveness* and performative *liveness* — and tune in the living presence of their figures to different and, in some ways, greater degrees. (This is true whether or not the hologram is a representation of a living or dead figure, or of a digital abstraction.) The form of the hologram — its translucent, spectral

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[12] Portraiture, as argued by Richard Brilliant (*Portraiture* (Cambridge: Harvard Univ. Press, 1991)), wields this presence effect (political or otherwise), making the image more than mere representation if not ontologically equal to their antecedent. What's important, though, he claims, is a spectator's change in perception and behavior in the presence of this simulated presence — behaviors that bear similarities to those in the presence of the real body. As Sartre writes, a portrait is a "quasi-person" with whom the spectator relates in a "projective synthesis" of image and reality (*The Psychology of the Imagination* (London: Routledge, 1948), 22-23). As I explored in my first qualifying exam for Ph.D. candidacy at UCSD, cubism constituted an attempt by makers of traditional portrait imagery to boost the spatial signal of their flat representations, pointing toward the later technical practices of capturing complete dimension in holography, and this itself constitutes a restoration of image ontologies enacted by pre-Renaissance, European religious icons, which had been "assigned a special reality and taken literally as a visible manifestation of the sacred person" (Hans Belting, *Likeness and Presence: A History of the Image before the Era of Art*, trans. Edmund Jephcott (Chicago and London: Univ. of Chicago, 1994), 471).

[13] Caroline Van Eck, *Art, Agency and Living Presence: From the Animated Image to the Excessive Object* (Chicago: Univ. of Chicago Press, 2015), 12 Richard Brilliant uses the same term to identify a portrait's unique effect: "the oscillation between art object and human subject" (Brilliant, 7). Both also utilize the term "aura" in describing the ineffable identity of an object or subject fixed by an artwork, loosening Benjamin's situation of the term within technological reproduction; this is discussed further in Chapter 4.

[14] Similarly to David Rodowick's reconsideration of Bazin's titular question in his study of digital film (André Bazin, *What Is Cinema?, Vol. 1*, trans. Hugh Gray (Berkeley: Univ. of California Press, 2005); D.N. Rodowick, *The Virtual Life of Film* (Cambridge, Mass. & London: Hardvard Univ. Press, 2007)), I'm questioning the experience of imagery through a reconsideration of its virtuality as enacted by holograms. Just as digital video has unsettled many understandings of traditional film, causing "its ontological anchors [to] have come ungrounded" (D.N. Rodowick, *Elegy for Theory* (Cambridge, Mass. & London: Hardvard Univ. Press, 2014), 66), so holograms unearth some of these same anchors by suggesting new and possibly richer ways that the image's "fingerprint" — or any of the myriad synonyms Bazin used to identify a spectral presence haunting representative technical imagery — engages in a quasi-mystical relationship with its (as I'm suggesting, spectralized) spectator. See also André Bazin, *André Bazin's New Media*, trans. Andrew Dudley (Oakland: Univ. of California Press, 2014).

appearance and liminal physics — is buoyed by discourses of death and haunting, but when presented and promoted in the contexts of direct representations of subjects for "live" interaction (in the imaginaries of Chapter 3) or even "live" performance (in the real-world case of Chapter 4) they communicate and blend the presence of their projection, the anima of their animation, and the life of technics. Ultimately, any signifier of death within the ghostly form of a hologram is meant to be seen as *rhetorically* immaterial.

But even as I claim that holograms exist within the physical space of their spectators, this is itself part of an ideology about holograms' enhanced materiality and embodiment; thus, I will posit instead that when a hologram is presented what it truly represents is not necessarily a flesh antecedent of its image body but rather the essential incompleteness of technically mediated communication itself. Thus, the holograms in this dissertation remain variously incomplete — transparent, untouchable, spectral, even fictional — and ask their spectators to engage with and reflexively accept this incompleteness. Holograms ask to be *seen* — as bodies rather than images, as social participants rather than referents, as the signified rather than signifier — but, in surrendering to the reality of their uncanny incompleteness, they also ask spectators to *see through* their imagery to the spectrality of the modern mediated encounter. By claiming but failing to fully enter, inhabit, and act within physical spaces, holograms focus the existing liminality of communication into sharper resolution — reifying and fusing concepts of spirit and flesh that are common to many human cultures (and especially redolent of Western, Judeo-Christian discourses about death and the afterlife) and concretizing metaphors of a technical media's essentially spectral nature (as suggested by scholars such as Jeffrey Sconce, John Durham Peters, and Friedrich Kittler, discussed below). As technical ghosts, holograms index a

limbo, a netherworld, a third space between materiality and immateriality, spirit and flesh, or other modes of the Cartesian binary.

In order to find, see, and make meanings from such technical imagery within this merged space, its viewing subject must rethink traditional discourses about looking at imagery and increase a viewing practice often disregarded and displaced in the experience: moving the viewing body. To communicate with a hologram is not simply to stand positioned as a solid spectator and marvel at a unique, spatialized form of spectral imagery; rather, it is to enter, inhabit, and act within the *shared* space of spectrality. The spectator of a hologram is hailed as a different kind of viewing subject from those looking at paintings, screens, even sculpture. The mobility asked of the viewing subject in order to register the imagery as holographic is significant, which contrasts with the more fixed spectator sought by traditional imagery and cinema. Those media continue to privilege the virtual space behind and beyond their surfaces and screens; the hologram, however, privileges the space of the spectator and demonstrates varying degrees of effort to manifest itself there. To experience that manifestation, the viewing subject before a hologram also may reach out and try to touch the spectral 3D figure. Based on visual technologies thus far, this spectator inevitably will fail in that attempt, but as the grasping hand finds only air the viewing subject perceives space and their alignment within it in a more free-floating, virtual way — experiencing the interaction from the perspective of a ghost.

Different from a telesubject or cybersubject,[15] the emerging holosubject doesn't just look at and think about virtual entities from the position of a fixed, corporeal spectator; they instead participate in a technically coordinated interaction as a virtual subject themselves — a

[15] The term *telesubject* seems unique to Jeffrey Sconce's study (*Haunted Media: Electronic Presence from Telegraphy to Television* (Durham & London: Duke Univ. Press, 2000)), and while he also uses *cybersubject*, that term predates him and is examined potently in Scott Bukatman's *Terminal Identity: The Virtual Subject in Postmodern Science Fiction* (Duke Univ. Press, 1993).

comingling of the virtual and the visceral within a novel mediated experience I call *holopresence*. Unlike *telepresence*, in which a sensory technology mediates a user's experience of a distant environment, holopresence technologies mediate a spectator's experience of a person's absent or archived presence, manifested as 3D imagery made to appear within the spectator's own space — no mental "travel" required of the spectator. Holopresence is not the extended experience of a distant space; it is the direct experience of a mixed space. Holograms are not simply projections of objects; they also are projections of space. They do not enter real space; they bring their space with them, a process that reorients the real and the virtual, overlapping them, mixing them, tuning them, so that the hologram spectator experiences a newly liminal space and a technically mixed reality. As an essential aspect of the kinds of devices and systems examined in this dissertation — technologies that project embodied, 3D imagery that augments reality by appearing unmediated, frameless, and screenless within the spectator's physical space — holopresence is thus a media modality that further complicates the usual distinctions between real and virtual, body and image, material and immaterial. Holopresence brings the idea of the virtual directly into the body.

By allowing spectators to interact with technical specters and conditioning them to such a schema of everyday reality, holopresence naturalizes haunting. It normalizes liminality, tuning down the essentially uncanny aspects of media interactions while projecting the hologram differently among spatial, social relationships. Holopresence re-creates the island of Dr. Morel, where Casares' fugitive eventually learns to "overcome the nervous repulsion I used to feel toward the images. They do not bother me now."[16] The historical cases of holopresence examined here provide experiences in which spectators learn how to meet and greet these

[16] Casares, 78.

emerging multimedia and multisensory forms. As more hologram and augmented-reality technologies line up to enter various markets in the 21st century, an understanding of how to negotiate and navigate holopresence will be crucial to the future coexistence with emerging holographic media. Knowledge production and meaning making from the experience of a hologram requires both rational, scientific methods and irrational, spiritualist practices, and this combination comprises a particular media savvy that grows increasingly relevant to contemporary encounters with "new" media technologies. I argue here that, rather than being either disenchanting or demystifying, these technologies of holopresence integrate the virtual and immaterial into experiences produced by real, material media, thus amplifying and naturalizing the uncanny truce between spirits and bodies, specters and spectators.

Methods, terminology, and Vilém Flusser's framework

Media archaeology provides the framework for my study of integrating virtual technical imagery into real spaces. As a method that focuses interdisciplinary attention on situated emergences of technical culture, media archaeology is especially adept at examining cyclical phenomena that seem to recur throughout specific historical contexts. Tom Gunning, Lisa Gitelman, Erkki Huhtamo, Jussi Parikka, Eric Kluitenberg, Bruce Sterling, and Simone Natale have defined and drawn upon media archaeology in order not only to unearth lost artifacts and situate sedimented histories but also to look at media as material expressions of specific discourses. Huhtamo & Parikka stress that media archaeology emphasizes "both the discursive and the material manifestations of culture,"[17] making it a useful methodology in the study of

[17] Erkki Huhtamo and Jussi Parikka, "Introduction: An Archaeology of Media Archaeology," in *Media Archaeology: Approaches, Applications, and Implications*, ed. Erkki Huhtamo and Jussi Parikka (Berkeley and Los Angeles: Univ. of California Press, 2011), 3.

media objects straddling the material and discursive. Kluitenberg's expansion of this scope to include media imaginaries[18] is not only important to my analysis of "hologram" emergence in Chapter 3 but to this dissertation's overall identification of real virtuality as a condition that may "appear and reappear across different times, oeuvres, and domains" and remain a singular idea even though its "signification can be radically different or simply incommensurable" at different times.[19] Potent media archaeologies within contemporary German media studies redirect Michel Foucault's archaeology of discursive social forces toward the material media that often participates in those discourses,[20] such as the work of Friedrich Kittler and Siegfried Zielinski (co-editor of the guide to Flusser's philosophy, *Flusseriana*[21]); additionally, Jens Schröter's media archaeology of the "technological transplane image"[22] is a model for my own historical investigation of 3D technical imagery.

The media archaeological process "rummages textual, visual, and auditory archives as well as collections of artifacts" in order to generate its "hermeneutic reading of the 'new' against

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[18] Eric Kluitenberg, "Second Introduction to an Archaeology of Imaginary Media," in *Book of Imaginary Media: Excavating the Dream of the Ultimate Communication Medium*, ed. Eric Kluitenberg (Rotterdam: NAi, 2006).

[19] Eric Kluitenberg, "On the Archaeology of Imaginary Media," in *Media Archaeology: Approaches, Applications, and Implications*, ed. Erkki Huhtamo and Jussi Parikka (Berkeley, Los Angeles & London: Univ. of California Press, 2011), 53-54.

[20] These scholars are providing addendums to Foucault's macro-analyses of European social discourses, which remain useful underpinnings for discursive investigations but which never quite reach a level of actual media analysis. Mark Poster, for instance, includes Foucault on a lengthy list of "major theorists from the 1970s onward who either paid no attention at all to the vast changes in media culture taking place under their noses or who commented on the media only as a tool that amplified other institutions" (Mark Poster, "An Introduction to Vilém Flusser's 'into the Universe of Technical Images' and 'Does Writing Have a Future?'," in *Into the Universe of Technical Images*, Electronic Mediations (Minneapolis & London: Univ. of Minnesota Press, 2011), xi). Geoffrey Winthrop-Young's analysis of Friedrich Kittler's media studies similarly notes that "Foucault remained a thinker of archives and libraries rather than of technologies" and thus failed to analyze the circulation of discourses at the level of active media systems (Geoffrey Winthrop-Young, *Kittler and the Media* (Cambridge: Polity, 2011), 59). Even Kittler's history of discourse, built on a Foucaultian foundation, "does not grapple with the basic issue of media specificity and its cultural implications" (Poster, xiii).

[21] Siegfried Zielinski, Peter Weibel, and Daniel Irrgang, eds., *Flusseriana: An Intellectual Toolbox* (Minneapolis: Univocal, 2015).

[22] Schröter, 3.

the grain of the past, rather than a telling of the history of technologies from past to present"[23]; my own process included rummaging through institutional archives (the University of Westminster, formerly the Royal Polytechnic Institution, for its historical records relating to Pepper's Ghost in Chapter 1, and the MIT Museum, which now houses artifacts and records from the Museum of Holography in Chapter 2), as well as the application of critical media analysis of science-fiction narratives and depictions (Chapter 3) and media ethnography of a large set of Twitter posts (Chapter 4). The questions I have asked throughout this process include inquiries about both the media effects of situated hologram encounters and how these emerging image forms represent and symbolize larger social changes. Setting the actual ontology of holograms aside, what is the phenomenology of their haunting moment? How is meaning made differently by a projected, spatial technical image compared with those still bound to screens? How is the hologram spectator hailed differently by the imagery, and what — in terms of Casares' protagonist — does this still-emerging process of communication make that viewing subject a fugitive *from*?

A particular challenge in writing this dissertation has been an initial linguistic struggle over the specific terminology to deploy in describing holograms and "holograms"[24] as I have grouped them here. Defaulting to calling them "images" seems inadequate for the task of differentiating the hologram's most novel characteristics. Casares' easy delineation of "a new kind of photograph" is helpful to a point — useful in support of my ultimate argument that holograms maintain and extend certain aspects of their photographic genealogy, but problematic in my effort to foreground the ways they break from it, too, by assertively denying this lineage,

[23] Huhtamo and Parikka, 3. The second quotation is quoted here, originally by media critic Geert Lovink.

[24] Throughout this study, I use quotation marks around the term when I feel the need to stress the lexical difference between the term's original meaning from physics and its more contemporary usage indexing digital technical imagery. Ultimately, by the Conclusion, the hologram has manifested in popular culture to a degree that allows me to drop the "scare quotes."

by veiling their photographic relations at the same time they veil their projecting apparatuses, and ultimately by masquerading within social relations as something *other* than an image. In this effort, I use a term proffered by the philosopher Vilém Flusser that is useful in uniting and classifying technologically constructed imagery of this type: the *technical image*.[25]

Flusser insists that antiquity, modernity, and postmodernity each align with a specific, dominant communication code: traditional images, written language, and technical images, respectively. Within each era or attitude, culture is shaped through hegemonic "structures (*material or not, technological or not*) in which codes function."[26] As opposed to the *traditional image* code, which is any image made by hand (e.g., drawing, painting) — "significant surfaces" marked with visual elements that may be read holistically, "seized at a glance,"[27] a practice he likens to magic[28] — the technical image instead is created with and delivered by a programmed apparatus (photography, film, video, digital images, holograms, etc.). Writing, for Flusser, has sanctioned a knowledge system with a distinct progressive order and cause-effect relationships.[29]

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[25] The cases in this dissertation rely on the extra-dimensional capacity of Flusser's classification — the virtuality of the technical image, but also the space implied by its depiction or (in my cases) presence. This aligns with a term from Jens Schröter's scholarship ("Volumetric Imaging as Technology to Control Space," *Acta Universitatis Sapientiae, Film and Media Studies*, no. 02 (2010); "Technologies Beyond the Still and the Moving Image: The Case of the Multiplex Hologram," *History of Photography* 35, no. 1 (2011); *3d: History, Theory and Aesthetics of the Transplane Image*), in which he has proposed the visual concept of a *technological transplane image*: any depiction that seeks to "*provide more information on space or the spatial structures of objects*" (ibid., 3, original emphasis). This differs, he claims, from spatial imagery, such as sculpture or globes, by creating a "break with the planocentric regime" (ibid., 38) and providing more information about an image-object's three-dimensional reality — or *possibility*, given that a transplane image may not (yet) have a material antecedent. Schröter's project remains a visual inquiry, though, whereas mine uses a similar model to pursue the same "systematical coherence" (ibid., 4) among transplane image-objects that also deliver additional multimedia/multisensory information.

[26] Zielinski, Weibel, and Irrgang, quoted on 268, emphasis added.

[27] Flusser, *Towards a Philosophy of Photography*, 6 For Flusser, there is no separate connotative and denotative meaning. In this move, he collapses Barthes' semiotic binary. "The meaning of the image as it is disclosed by scanning, then, is the synthesis of two intentions: the one manifest in the image itself, the other in the observer. Thus, images are not 'denoting' symbol-complexes such as numbers, for instance, but 'connoting' symbol-complexes: images offer room for interpretation" (ibid.).

[28] Ibid., 60.

[29] See Vilém Flusser, *Language and Reality*, trans. Rodrigo Maltez Novaes (Minneapolis & London: Univ. of Minnesota Press, 1964/2018); Vilém Flusser, *Does Writing Have a Future?*, ed. N. Katherine Hayles, Mark Poster, and Samuel Weber, trans. Nancy Ann Roth, vol. 33, Electronic Meditations (Minneapolis & London: Univ. of

In a dialectical progression, technical images restore something of the earlier magic of traditional imagery while subsuming writing into the machine instructions and digital coding that order and constitute the new imagery. Flusser's two defining characteristics of technical imagery are primary qualities of holograms: its projection from an apparatus and its seemingly immaterial character. Thus, I use the term to classify the cases examined here. However, beyond merely labeling holograms as Flusserian technical imagery, I am reframing Flusser's concept *as* holographic. That is, contrasted with other surface or screen imagery that Flusser classifies as technical, I assert that holograms concretize his core concept of immaterial projection in ways significantly beyond what photographic surfaces or electronic screens achieve — by positioning the hologram spectator in relationship with the image as projected distinctly apart from its originated source or framed constraint — and that holograms manifest a novel experience with what Flusser calls "immaterial culture."[30] Importantly, this is a phenomenological more than

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Minnesota Press, 2011). Flusser's epochal delineations should not be read as overly determinist. As Elizabeth Eisenstein, who studied printing specifically (one might say, a technical image of writing), recognized more of a trade-off in the transition from traditional imagery to text — noting that "the formula image-to-word holds only for a limited set of phenomena, for printing also endowed graven images with a new lease on life" ("The Emergence of Print Culture in the West," *Journal of Communication* 30, no. 1 (1980): 99) — Flusser also recognizes the push and pull of these not-quite-clean epistemic ruptures. He also posits that writing contributed to modernity's ocularcentrism by fixing the communication of knowledge to a visual rather than oral practice. Marshall McLuhan, a common touchstone for comparing Flusser's theories (and I would add Frances Yates and Walter Ong to that constellation), argued that writing required more visual acuity to make sense of it, and this is not at odds with Flusser's thinking. But where McLuhan saw a kind of return to oral tradition in the imagery of television and Ong claimed a "secondary orality" had emerged through radio, Flusser's technical imagery — a shift back to images after the era of writing — constitutes a kind of *secondary visuality*. Then again, one could argue that Flusser's communicology is itself constrained by modern ocularcentrism in that each of his three dominant communication codes is essentially visual.

[30] See Flusser, *Into Immaterial Culture* Elsewhere, Flusser writes, "Although they appear to do so, technical images don't depict anything; they project something. The signified of a technical image, whether it be a photograph of a house or a computer image of a virtual airplane, is something drawn from the inside toward the outside" (Flusser, *Into the Universe of Technical Images*, 48). This drawing from inside to outside, however — inside meaning a hidden realm of virtuality, and outside meaning the real space of human life — constitutes a materialization of the immaterial, a projection of an idea not *just* onto a surface but shared with the physical space of a spectator. Previous technical images achieve this through inversion; they extend spectator space beyond a surface or screen. Holograms, though, evert rather than invert; they actualize Flusser's projection, bringing abstractions from the inside of technical systems to the outside of embodied spectator interactions. This may be representative — as the first optical holograms were representations of (or replays of light reflection from) existing physical objects — though Flusser routinely insists that technical images "do not represent: they model" (Flusser, *Into Immaterial Culture*, 31), locating their uniqueness in their ability to materialize abstractions in a way that is metaphorically holographic.

ontological, distinction. A technical image is *experienced* as immaterial, despite having significant and even visible material support; however, unlike the physically inscribed, manipulated surfaces of traditional images, technical images embody an experience with technical media that makes more visible its immaterial and even idolatrous aspects, thus offering a new mode for making meaning and a postmodern (or, as Flusser writes, "post-history"[31]) episteme that Flusser suggests is in a lengthy process of continuing emergence. Lengthy, that is, but nonetheless revolutionary — the technical image constitutes for Flusser a "cultural revolution" heralding a "radically new" form of communication.[32] Similar language of rupture will be seen echoing throughout my historical cases, in which adopters and developers of holograms routinely proclaim for them positively Kuhnian[33] paradigm-busting powers.

As Flusser's categories align with transecting eras and attitudes of modernity and postmodernity, this dissertation engages with distinct sets of literatures during the last several decades offering multiple perspectives on the discourses and imaginaries of the European Enlightenment — specifically, studies that locate and surface within those discourses and imaginaries a similar tension between solidity and spectrality, between the objective truths espoused by rational technoscience and the mixture of material and immaterial experience bound up within ideas of the Enlightenment and its culture. Holograms participate in destabilizing viewing subjects in ways that toy with Foucauldian concepts of what is made visible or invisible within modern life, and Foucault underpins much of the social theory discussed below, namely

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[31] See Vilém Flusser, *Post-History*, trans. Rodrigo Maltez Novaes (Minneapolis: Univocal, 1983/2013). Flusser's "post-history" is somewhat akin to other post-historical concepts. Like, say, Francis Fukuyama's political victory for liberal democracy at the "end of history," Flusser is describing an epistemological shift away from historical thinking (from discursive codes of communication that imply a linear progression by their very function) toward a mode of thinking that is more circular and multi-dimensional — literally but also figuratively dialogic— in terms of the inherent holism of traditional imagery and the holographic potential of technical imagery.

[32] Flusser, *Into the Universe of Technical Images*, 7, 13.

[33] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 50th anniversary (2012) ed. (Chicago: Univ. of Chicago Press, 1962).

Jonathan Crary's postulation of a modern observer shaped by spatial image technologies and Friedrich Kittler's foregrounding of media in the work of discourse.[34] Following Chandra Mukerji's critique of modernity through examinations of specific cultural practices and discursive objects — historically situated cases that "both enact and defamiliarize taken-for-granted aspects of modern culture" — my analysis of selected emergences of holograms looks at how each iteration of a similar visual concept allows for opportunities to renegotiate modern and postmodern attitudes of looking and being, "making them available for practicing cultural skills and reflecting on common-sense practices."[35] That is, encounters with spatialized imagery open opportunities for mixing everyday interpersonal practices with existing modes of interaction with traditional imagery and media technology.

Real virtuality: A visual genealogy from photography to holography

My identification and analysis of holopresence also intersects with a direct line of visual-studies critiques about the nature, experience, and interpretation of photography since its invention in the early 19th century. As Flusser suggests, the arrival of photographic communication constituted a rupture within classical ideas about representation, whose

[34] Flusser and Foucault intersect theoretically despite not really having done so in life. Foucault was writing his early influential works in the 1960s in France when Flusser was writing his first communicology texts in Brazil. The extent to which they encountered each other's ideas can be discerned only from the virtual lack of citation on either side. Foucault is barely ever name-checked by Flusser himself; however, introductions to Flusser's books written by other scholars as well as much literature about him features consistent, matter-of-fact connections to Foucault's thinking, namely by Mark Poster in both "Mcluhan and the Cultural Theory of Media," *MediaTropes* 2, no. 2 (2010) and "An Introduction to Vilém Flusser's 'into the Universe of Technical Images' and 'Does Writing Have a Future?'," A brief autobiographical account of Flusser's thinking, "In Search of Meaning (Philosophical Self-Portrait)," mentions that, in struggling to find "a way out into nonlanguage within the loops of the tissue of language," Flusser penned a (still-unpublished) essay "influenced by Foucault" (*Writings: Vilém Flusser*, ed. N. Katherine Hayles, Mark Poster, and Samuel Weber, trans. Erik Eisel, vol. 6, Electronic Mediations (Minneapolis & London: Univ. of Minnesota Press, 2002), 205). Zielinski points out, though, that Flusser learned that "the world and reality are basically communicated via various systems of symbols and important conventions" not from Foucault but from Ernst Cassirer's phenomenology of knowledge in the 1920s (Zielinski, Weibel, and Irrgang, 8).

[35] Chandra Mukerji, *Modernity Reimagined: An Analytic Guide*, Contemporary Sociological Perspectives (New York: Routledge, 2016), 123.

theoretical fissures continue to affect contemporary understandings of visual media, including holograms. Photography's new visual fidelity to its subjects allowed for early claims about positivist objectivity and a purer mimesis compared to previous traditional images fashioned by hand, and the resulting discourses around photography distilled a number of existing ideas about the relationship of visual representation to the discovery and communication of objective truth.[36] These same discourses nurtured the discovery of new, three-dimensional optical principles in postwar physics, as Dennis Gabor's theory of holography in the late 1940s was designed to increase the resolution of electron magnifiers — producing not only a kind of photo with remarkable 3D fidelity but yet another technology designed to make visible the invisible, from microscopes to telescopes, in the service of rational science (see Chapter 2). As the same image form was taken up outside of purely scientific practices, a holographic experience of visual culture began to require new kinds of viewing practices by a new kind of viewing subject.

The first technical image, the photograph, already wields a spectralizing power. Scholars such as Allan Sekula have been instrumental in undoing understandings of photography as a purely instrumental practice, pointing out that photographs, like holograms, participate in a kind of material bait-and-switch, promising more of the absent subject's concrete presence while still withholding its complete manifestation and leaving phenomenological gaps to be filled with individual and social conjecture. Photography thus spectralizes its subjects by, as Karen Beckman phrases it, promising to "proffer but ultimately withhold" that subject[37], or, per Sekula, claiming complete communication while delivering instead "an 'incomplete' utterance,"[38] thus

[36] See Lorraine Daston and Peter Galison, "The Image of Objectivity," *Representations* 40 (1992).
[37] Karen Beckman, "Nothing to Say: The War on Terror and the Mad Photography of Roland Barthes," *Grey Room* 34 (2008): 107.
[38] Allan Sekula, "On the Invention of Photographic Meaning," in *Thinking Photography*, ed. Victor Burgin (London: Palgrave, 1982), 84.

recasting the subject "as a 'thing apart,' and as an *abstraction*."[39] Sekula emphasizes that word within a specific study of industrial photographs in order to connect Marxism's alienation of labor (via the abstraction of its products) to this specific function Sekula locates within the practices of photography and the apparatus of the camera: a transformation of objects and subjects into spectral forms, ghosts that are positioned at a site of social interaction once or twice removed from the antecedent source of the object or subject. If, as Simon During writes, Marxism finds that capitalism "provokes magical thinking that conjures away the labor required for commodity production, so that commodities seem magically to speak for themselves,"[40] then, per Sekula, "photography is not the harbinger of modernity … photography is modernity run riot,"[41] delivering its imagery as spectral projections meant to stand in and speak for its alienated subjects across a variety of social interactions. Holograms extend this riot exponentially, naturalizing the supernatural experience of spectral forms and commodifying its objects as full-fledged participants in material and social exchange. They fulfill Sekula's "crypto-baroque promise of redemptive embodiment — 'corporeal qualities' and 'intimate relationships' — [which] is not unlike that offered by the virtual world" of contemporary digital technologies.[42] Holograms help to justify and naturalize the modern spectrality of social objects and communicating subjects.

But while holograms (the optical more than the digital) surrender some of photography's visual realism — often showing themselves to be semi-transparent and thus markedly spectral —

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[39] Allan Sekula, "Photography between Labour and Capital," in *Mining Photographs and Other Pictures, 1948-1968*, ed. Benjamin H.D. Buchloh and Robert Wilkie (Halifax: The Press of the Nova Scotia College of Art and Design, 1983), 247.

[40] Simon During, *Modern Enchantments: The Cultural Power of Secular Magic* (Cambridge, Mass.: Harvard Univ. Press, 2004), 25.

[41] Allan Sekula, "The Body and the Archive," *October* 39 (1986): 4.

[42] Allan Sekula, "Between the Net and the Deep Blue Sea (Rethinking the Traffic in Photographs)," *October* 102 (2002): 19-20.

they make more explicit an aspect of spatial presence that photography by itself only implies. Again, it's important to situate the emergence of this volumetric experience amid that riot of modernity during the mid-19th century, when photography was only the first of numerous novel technologies churned up by the mid-1800s' "frenzy of the visible"[43] instigated by photography's particular challenge not only to representation but to previous understandings and positionings of the viewing subject. Amid that frenzy were momentary inventions and distillations of a wide variety of visual devices and viewing experiments — the phenakistiscope, magic lanterns, the thaumatrope, the stroboscope, the zoetrope, dioramas, panoramas, and many more, including systems such as Pepper's Ghost (Chapter 1). Jonathan Crary's study of one of those devices, the stereoscope, argues that these participated in uprooting the stationary position of classical spectatorship, fixed by the perspective of the camera obscura, and in hailing a new, more mobile modern spectator.[44] Even though each of these devices faded from view within the eventual scientific and cultural hegemony of the still photo and the animated film by the end of the century, Crary's view is still resonant in this century because the modern viewing subject he describes continues to emerge. Holograms are direct extensions of the same visual experimentation with space and subject positioning. But while Crary only nods toward "elements of continuity that link contemporary imagery with older organizations of the visual,"[45] Erin Blake's study of the zograscope (from the earliest moment of this visual frenzy) more directly links these nascent viewing experiments with virtual-reality technologies contemporary to the

[43] Jean-Louis Comolli, "Machines of the Visible," in *The Cinematic Apparatus*, ed. Teresa de Laueretis and Stephen Heath (London: Macmillan, 1980), 122.
[44] Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge: MIT Press, 1990) See also Jonathan Crary, "Géricault, the Panorama, and Sites of Reality in the Early Nineteenth Century," *Grey Room*, no. 09 (2002).
[45] Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century*, 2.

21st century.[46] Both studies examine early devices presenting experiences of 3D imagery and the novelty of real space merged with virtual space, and while the actual mobility of zograscope and stereoscope viewers often is miniscule compared to the larger movements of the hologram viewer (especially as detailed in the spaces of the Museum of Holography in Chapter 2), what both Crary and Blake are describing as a transformative historical moment is central to my study, too: that an experience of a 3D image and the mobility required of a spectator in order to view it *as* 3D alters power relationships between image and subject, boosting the ontological status of the image within the encounter (though, as I ultimately argue, correspondingly also boosting the spectrality of the spectator). When Blake describes the experience, she claims that "there is something *visceral* … about a visual object" in this context,[47] using a potent adjective to evoke the human body as re-centered within the process of meaning-making. This dissertation parades holograms as distinctly visceral visual objects, which engage more of their viewing subjects' bodies than just the eyes and activate a more fully embodied mode of meaning-making.

The situated viewing experiences of Crary's stereoscope and Blake's zograscope, however, bear important distinctions from that of the holopresence described by this study, which seeks to follow where else this enlightened, embodied observer and their unique visual experiences had gotten to since the 19th century. Crary situates the stereoscope among devices participating in "a rupture with Renaissance, or *classical,* models of vision and of the observer" and the creation of "a notion of vision that the classical model was incapable of encompassing," yet he withholds this emergent experience from that of cinema, which came to dominate the projection of virtual imagery by the end of that century, delineating film as comparatively regressive for the way it reasserts "a Renaissance-based mode of vision" based on perspective,

[46] Erin C. Blake, "Zograscopes, Virtual Reality, and the Mapping of Polite Society in Eighteenth-Century England," in *New Media, 1740-1915*, ed. Lisa Gitelman and Geoffrey B. Pingree (Cambridge, Mass.: MIT Press, 2003).
[47] Ibid., 14.

POV, and a fixed spectator.[48] Likewise, Tom Gunning is careful not to situate all pre-cinema technologies as mere stepping-stones along the inevitable march toward cinema (a privilege of film studies), and he applies a label to a particular subset of them, differentiating their effects and experiences from film by dubbing them "the cinema of attractions" and lamenting the moment when this visual experience "goes underground" by the end of the century.[49] A similar "frenzy of the visible" would occur a century later when, as Roland Barthes noted at the close of the 1970s, "there does seem to be a kind of 'theoretical boom' in photography,"[50] which included the generation of Flusser's flagship text about technical imagery, *Towards a Philosophy of Photography*.[51] This dissertation maps onto this historical span, as a full century passes between my first and second cases, between the frenzy over Pepper's Ghost in the mid-1800s and the display of aesthetic optical holograms in the 1970s,52 as well as the popular depiction of a

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[48] Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century*, 3, 68, 64. Crary, in particular, is careful not to lump too many of these devices together to claim a single media effect contributing to (or opposing) cinema. But film studies, he says, does this, tending to "position them as the initial forms in an evolutionary technological development leading to the emergence of a single dominant form at the end of the century. Their fundamental characteristic is that they are not yet cinema, thus nascent, imperfectly designed forms. Obviously, there is a connection between cinema and these machines of the 1830s, but it is often a dialectical relation of inversion and opposition, in which features of these earlier devices were negated or concealed. At the same time there is a tendency to conflate all optical devices in the nineteenth century as equally implicated in a vague collective drive to higher and higher standards of verisimilitude. Such an approach often ignores the conceptual and historical singularities of each device" (ibid., 110.).

[49] Tom Gunning, "The Cinema of Attractions: Early Film, Its Spectator, and the Avant-Garde," *Wide Angle: A Film Quarterly of Theory, Criticism, and Practice* 3, no. 4 (1986): 64. Gunning's extra term means to highlight the greater spectacular nature of these pre-cinematic visuals ("its ability to *show* something," 64, original emphasis), contrasting this specifically with cinema's later narrative focus and fixed spectator. For more on a dialectic between spectacle and narrative cinema, see Laura Mulvey, "Visual Pleasure and Narrative Cinema," *Screen* 16, no. 3 (1975).

50 "Roland Barthes Interviewed by Laurent Dispot (Feb. 22, 1980)," in *Roland Barthes, the Grain of the Voice: Interviews 1962-1980* (New York: Hill & Wang, 1985), 351. Indeed, Walter Benjamin's "A Little History of Photography" and "The Work of Art in the Age of Mechanical Reproduction" had been translated into English within the previous two decades, and the publication of several pivotal works of photo theory clustered in the late 1970s — Susan Sontag, *On Photography* (New York: Picador, 1977); Mulvey, ; Allan Sekula, "On the Invention of Photographic Meaning," *Artforum* 15, no. 5 (1975); Victor Burgin, "Looking at Photographs," *Screen Education*, no. 24 (1977) — even as film theory was taking shape between the pivotal works of André Bazin (*What Is Cinema?, Vol. 1*) and Gilles Deleuze (*Cinema I: The Movement-Image*, trans. Hugh Tomlinson and Barbara Habberjam (Minneapolis: Univ. of Minnesota Press, 1986).

[51] Flusser, *Towards a Philosophy of Photography*.

[52] This is not to imply that holopresence disappeared completely between my particular cases. Pepper's Ghost faded from London theaters in the late 1800s but became a staple fairground attraction throughout Britain and later re-

"hologram" in the first *Star Wars* movie in 1977. In the intervening decades, cinema merely returned virtual space to that behind the casements first described within Leon Battista Alberti's 15th-century instructions to painters, calling upon them to consider the canvas like a window open to the depicted virtual space.[53] Anne Friedberg's analysis of computer screens follows how digital computations allow for extensions of the same metaphor.[54] But while she observes that virtualities presented on digital screens may be made permeable or stacked atop each other, those same screens remain flat sites on which the electronic imagery is displayed — still something of the "significant surfaces" Flusser ascribes to traditional imagery — which only maintains and reorganizes the classical perspective available to a fixed spectator looking *through* the "virtual window." These viewing experiences hail a viewer embodied differently than the holosubject.

To summon that viewer and assist in the emergence of the holosubject, the "fourth wall" of theater parlance must be removed. The screen must cease to function as a one-way traffic regulator, allowing only a spectator to look from the real toward the virtual, and mediate instead the projection of the virtual into the real — conjoining spaces rather than separating them. This, in fact, is a key characteristic of Gunning's cinema of attractions: that it does not assume a screen between its subject and its viewing subjects — its visuals contain "the recurring look at the camera by the actors," which becomes a no-no in later cinema for the way it reveals the illusion of its realism but which is "here undertaken with brio, establishing contact with the audience."[55] The absence of this boundary means that the virtuality of the image has not yet been separated from the spectator's physical reality and isolated behind a screen. This same seemingly open

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emerged as a featured illusion in Disneyland's Haunted Mansion phantasmagoria in the late 1960s. The fad of 3D movies in the early 1950s also could be seen as participating in the merging of real and virtual spaces I'm describing here.

[53] Alberti,

[54] Friedberg,

[55] Gunning, 64

access to the virtual *through* the media causes Blake also to liken the zograscope's peculiar enhancement of an image's depth into "what is today called 'virtual reality,' a space that is enacted technologically and perceived by viewers but that exists nowhere on its own."[56] But while I seek to make similar connections between the visual flux of the Victorian era to contemporary digital practices, my study is not one of *virtual reality* (at least not in the colloquial sense of that now-common technical term) but of *real virtuality*.

Philosophical concepts of virtuality that presaged modern visual technologies — from Bergson's and Deleuze's understanding of the virtual as opposing the *actual* rather than the *real*, and its foundation on Proust's confectionary notion of the "real but not actual, ideal but not abstract"[57] — remain intact here; however, rather than negotiating these relationships on an image surface or behind a screen, the virtuality of holopresence is actualized within spectator space, acting or at least presenting as real material. Consider a distinction of the optical holography examined in Chapter 2, in which holograms are classified as either of two types: *virtual*, meaning the image appears to exist behind the glass plate, and *real*, which are images that appear to exist in front of the plate, within the same space as the spectator. The real hologram merges its virtuality with its spectator's, seeming to lure the spectral image out of its virtual netherworld. But that netherworld does not exist, at least not the other space viewed *through* a zograscope or beyond a cinema screen. This dissertation concentrates its analysis on experiences of real holograms and "holograms" — of real-virtuality cases in which embodied,

[56] Blake, 4. For a thorough survey of the historical concept of virtual reality, especially within pre-electronic technologies, see Randall Packer and Ken Jordan, eds., *Multimedia: From Wagner to Virtual Reality* (New York & London: W.W. Norton, 2001).

[57] See Gilles Deleuze, "The Virtual," in *Deleuze: The Clamor of Being*, ed. A. Badiou (Minneapolis: Univ. of Minnesota, 2000); Gilles Deleuze, *Bergsonism*, trans. Hugh Tomlinson and Barbara Habberjam (New York: Zone, 1991).

spectral, technical imagery has been projected so that not only its virtual image but its virtual space merges with the real in an experience of reality recognizable to the emerging holosubject.

A similar theoretical binary fuels problematic concepts such as *cyberspace*, a dominant discourse of the networked internet that isolates the digital virtual to an illusory realm of ideal experience separate from that of the body and accessible only via technology.[58] William Gibson coined that influential term nearly a decade before the internet saw wider public usage, but even he walked it back in a novel a quarter century later, describing the virtual space not as a separate realm to be entered and exited but instead as an essential element of existing total experience. "Someone told me that cyberspace was 'everting,'" says one of Gibson's characters. "And once it everts, then there isn't any cyberspace, is there? There never was, if you want to look at it that way. It was a way we had of looking where we were headed, a direction."[59] Gibson is describing the precise looking practice enacted by technologies of holopresence — a way of seeing the virtual everted within the actual, and taking both to be real. The spectator's eyes are lured from the "virtual window" because the virtualities behind those windows also are lured out into the open, as it were, to be concretized and naturalized within the space of the spectator. Media metaphors about conjoined real and virtual spaces dissolve as virtual objects and holosubjects are situated together as simply another kind of actuality.

Holopresence: Living between materiality (life) and immateriality (death)

The bringing together of a spectral virtuality and an allegedly fixed material reality, however, has significantly spiritual implications. The real-virtual binaries bifurcating post-

[58] William Gibson coined that term in his novel *Neuromancer* (in which the user's inert body is referred to with open derision as mere "meat"), and it has shaped the depiction of interaction with virtual entities throughout science fiction (in films such as *The Matrix*, where bodies lie immobilized while brains "jack into" virtual spaces).
[59] William Gibson, *Spook Country* (New York: Penguin, 2007), 86.

Enlightenment culture described above map onto a larger Judeo-Christian sense of separate spaces for the mortal and the spectral, the living and the dead. Holopresence technologies are further iterations of media systems that disrupt such a boundary through the embodied projection of their spectral forms. There's no avoiding it: holograms look like ghosts. Many, if not most, of their uses have been presentations of their spectral imagery specifically for communion with the dead, from the depicted hauntings of Pepper's Ghost (Chapter 1) to the resurrection of dead pop stars (Chapter 4). Modern media technologies have lengthy associations with the production of spiritual experiences, which holopresence systems embolden and make blatant. An experience of real virtually may not *require* technology to enact it, but modern communication media have been evolving consistently to serve that specific function. John Durham Peters' history of the very idea of communication declares, "Every new medium is a machine for the production of ghosts."[60] The same year, Friedrich Kittler similarly claimed, "Media always already yield ghost phenomena."[61] James W. Carey notes the "religious origins" of the telegraph in the 19th century; Tom Gunning claims that, through the emergence of photography and film, "the concept of the phantasm gains a new valency as an element of the cultural imaginary"[62]; and Jeffrey Sconce's *Haunted Media* extends an essentialism of the "media occult" as far forward as television in the 20th century.[63] Sconce's historical study claims that all electronic media[64] are imbued with a

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[60] John Durham Peters, *Speaking into the Air: A History of the Idea of Communication* (Chicago: Univ. of Chicago, 1999), 139.

[61] Friedrich Kittler, *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz, Writing Science (Stanford: Stanford Univ. Press, 1999), 22.

[62] Tom Gunning, "To Scan a Ghost: The Ontology of Mediated Vision," in *The Spectralities Reader: Ghosts and Haunting in Contemporary Cultural Theory*, ed. María del Pilar Blanco and Esther Peeren (New York & London: Bloomsbury, 2007/2013), 211.

[63] James W. Carey, *Communication as Culture: Essays on Media and Society* (Boston & London: Unwin Hyman, 1989), 14; Sconce, 5.

[64] Much of the media-archaeological work making such claims tends to weight them toward electronic media, such as Carey's insistence that electricity, as a powerful but invisible resource, provides the "key to the mystery" of these technologies (Carey, 206), one that even Daniel J. Czitrom, in his media history, said "seems to connect the spiritual and material" (*Media and the American Mind: From Morse to Mcluhan* (Chapel Hill, N.C.: Univ. of North Carolina

"seemingly 'inalienable' yet equally 'ineffable' quality" that remains their hallmark,[65] while Peters' argument locates core concepts of the fields of communication and media studies within the development of 19th-century spiritualism and its use of mediums for communing with the dead, practices that translate into modern experiences of technically mediated communication.[66] Holopresence is distinctly spiritualist in that, like experiences designed by 19th-century mediums, the technology is positioned not as a means through which spectators may look into the virtual but from which the virtual allegedly is drawn out and manifested within the here and now, in ways that may be experienced across the spectrum of human senses.[67]

Within that translation, however, is a crucial reconfiguration and repositioning of the body within the process of mediation. The switch from human mediums to technical media as the sanctioned go-betweens astride the material and immaterial constituted, as Sconce puts it, "the humanist illusions of traditional metaphysics replaced by the technological illusions of electronic presence."[68] In the 19th century — certainly by social engineers in places such as the Royal

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Press, 1982), 9). Given that two of the cases in this dissertation are spectator experiences of non-electronic 3D imagery, I am less reliant on the power grid for my identification and definition of holopresence and its technical but not necessarily physically charged experience of virtuality. When Kittler refers to "ghosts, a.k.a. media" he does so by following with an example of literature in a book that examines the (originally unpowered) typewriter, and when he examines "celluloid ghosts" he does so while stressing that cinema is usually electrically powered but that the core animation practices it is based on do not *require* that power to create this effect (Kittler, 130, 166).

[65] Sconce, 6. More broadly, just as critic Mark Fisher claims a hauntological aspect to all modern culture (*Ghosts of My Life: Writings on Depression, Hauntology and Lost Futures* (Alresford, UK: Zero, 2014)), Slavoj Zizek has declared that the return of living dead is the "fundamental fantasy of contemporary mass culture" (*Looking Awry: An Introduction to Jacques Lacan through Popular Culture* (Cambridge, Mass. & London: MIT Press, 1991), 22).

[66] Spiritualism, central to Chapter 1, is a belief system and social movement that emerged in the mid-1800s spanning western Europe and the United States and based not only on the belief in spirits but on practices of summoning and speaking them. Through summonings and séances, per Peters' analysis, communing (originally a Christian term related to receiving the Eucharist) came to mean a specifically spiritualist goal: intimate connection with an absent other. To receive this communion, this *communication*, one had to facilitate a *medium*. This churchly idea of a requisite intermediate persisted as "medium" and came to connote, in the 1850s, both a spirit guide *and* a mass communication technology; the latter denotation was cemented as the term was pluralized in the 20th century throughout Western interactions with emerging mass media.

[67] Spiritualist séances often were not just visual but multi-sensory experiences featuring sound (e.g., table-rapping), touch (brushing spectators in the dark with feathers or other objects), smell (incense and the production of various odors), even potentially taste (the production of ectoplasm from mediums' mouths).

[68] Sconce, 207.

Polytechnic Institution (Chapter 1) — this transition was operationalized as a disenchantment of reality, replacing irrational superstition with rational knowledge practices. But, as Sconce says, "metaphysics do not die so easily,"[69] and rather than exorcising ghosts from everyday life, the move toward sanctioning technics merely resituated the spectral *as* technical. As modern media technologies evolved into increasingly everyday experiences, encounters with their disembodied voices and spectral imagery became a sort of normalized séance, with participating subjects hailed to call absurdly into the ether until some sound or image materialized by the technology satisfies a socially sanctioned expectation of personal presence and interpersonal connection. Interactions with "this new modern range of imagery devised to portray (and in a sense create) a new concept of the body and its energies,"[70] as Gunning says, so the modern viewing subject is recast as one that consults media specifically in order to conjure ghosts. The shape of this constructed viewing subject may differ slightly according to the programming and interface design of the media apparatus delivering the spectral encounter; Sconce's "telesubject" is just one engagement among many with "virtual subjectivity,"[71] including the nascent holosubject still taking shape within the cases examined here.

Routine encounters with the spectral figures of holograms and "holograms" disrupt a spectator's sense of self and solidity. Just as frolicking with phantoms led Casares' island fugitive to begin viewing himself as "some *other* dead man of *another* sort, at a different phase of his metamorphosis"[72] — as a different ghost in a new machine — holopresence nurtures holosubjects who question the stability of their own everyday experience, even to the point of interrogating allegedly fixed boundaries between what is alive and what is dead. A driving

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[69] Ibid.

[70] Tom Gunning, "Haunting Images: Ghosts, Photography, and the Modern Body," in *The Disembodied Spirit*, ed. Alison Ferris (Brunswick, Maine: Bowdoin College Museum of Art, 2003), 14-15.

[71] Sconce, 207.

[72] Casares, 52, my emphasis.

discourse of cyberspace, as mentioned above, posits a Cartesian disconnect between body and mind, solidity and spectrality, and amplifies certain ideals of a traditionally screened space that, per Vivian Sobchack, "uniquely *incorporates* the spectator/user in a spatially decentered, weakly temporalized and quasi-disembodied state."[73] A similar warrant dominates computer-science scholarship about VR: that a solid, stable spectator stands within real space, while their awareness "travels" into the separate realm of the virtual, immersing in its totality of abstraction in order to manifest a shade of embodied experience comparable to physical reality. Augmented-reality (AR) technologies, however, have begun to disrupt this neat division, recasting the binary as a scale, such as Milgram & Colquhoun's Reality-Virtuality Continuum (**Figure 0.1**).[74] One of the unique ways holopresence augments reality can be seen in the arrows on either side of Milgram & Colquhoun's gradient. Studies of virtual subjects assume the primacy of the left arrow — a solid body starts from the left and steps gingerly to the right, into greater degrees of virtual experience — while holopresence highlights the right arrow, the projection of virtual content toward and into physical reality. Instead of a digital screen in the middle separating but mediating between spectator-in-reality and image-in-virtuality, the bracketed depiction of "Mixed Reality" in this figure expands the breadth of the constructed encounter. The aperture between real and virtual has changed from a (visible) "window" into the (veiled) lens of the projecting apparatus, at the far right of the scale, which projects its programmed abstractions toward the newly shifted space of interaction. This expanded space means that the reality of the

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[73] Vivian Sobchack, "The Scene of the Screen: Towards a Phenomenology of Cinematic and Electronic Presence," *Post Script: Essays in Film and the Humanities* 10 (1990): 56.

[74] Paul Milgram and Herman Colquhoun, "A Taxonomy of Real and Virtual World Display Integration," in *Mixed Reality: Merging Real and Virtual Worlds*, ed. Y. Ohta and H. Tamura (Secaucus, N.J.: Springer-Verlag, 1999). See also Jay David Bolter and Blair MacIntyre, "Is It Live or Is It Ar?," *Spectrum, IEEE* 44, no. 8 (2007), which describes a similar "continuum that begins on one end with the naked perception of the world around us. From there it extends through two stages of 'mixed reality' (MR). In the first one, the physical world is like the main course and the virtual world the condiment … In the other stage of MR, the virtual imagery takes the spotlight. Finally, at the far end of the continuum lies nothing but digitally produced images and sounds, the world of virtual reality" (33).

viewing subject may be augmented by virtual projections but also that the subject may augment virtuality — haunting as well as being haunted, conjuring as well as being conjured, and projecting themselves rather than only receiving projections.

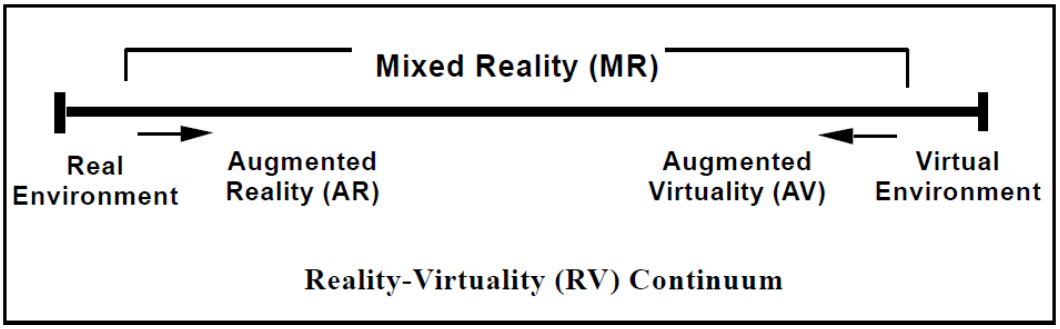

Figure 0.1. Milgram & Colquhoun's scale of technically mixed reality.

A technical mixed-reality environment, I argue, is not merely a cocktail of stable bodies being fed a diet of abstract symbols; rather, the two dissolve into an experience of each other somewhere between the material and the abstract — one virtual entity to another. Maurice Merleau-Ponty wrote this way about the body's experience within everyday reality,[75] saying that the body exists less as a discrete physical entity and, per Lisa Cartwright's summation, more as "a weak but pervasive and articulate material inhabitance"[76] — as an entity not so much manifesting itself in the world as projecting an image of itself in order to encounter and interact with the images of other objects and bodies. In critiquing discourses about how humans think of their physical being in the world, he referred to the "body image," a projection of an idea of a body that goes forth to meet the projections of other objects and subjects[77] (perhaps a privileged

[75] See Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (New York: Humanities Press, 1962); Maurice Merleau-Ponty, *The Visible and the Invisible*, ed. John Wild, trans. Alphonso Lingis, Northwestern University Studies in Phenomenology and Existential Philosophy (Evanston: Northwestern Univ. Press, 1968).
[76] Lisa Cartwright, "The Hands of the Projectionist," *Science in Context* 24, no. 3 (2011): 458.
[77] See Merleau-Ponty, *Phenomenology of Perception*.

image among Bergson's "universe of images" that comprises everyday experience[78]). Merleau-Ponty's body and its image haunt the world, and the space of that haunting he much later labeled (perhaps ironically) "the flesh," a site of encounter between "the seer and the thing," a kind of plasma between subjects and objects that is "their means of communication" and that is manifested more directly whenever, say, cyberspace everts, or when holograms are conjured, or when holosubjects experience this relational space of "intercorporeal being," where the "reversibility of the visible and the tangible" plays out.[79] As an inextricable combination of material and immaterial, holopresence produces a more vivid experience of intercorporeality and its flux of being. This is the bracketed ground of the Milgram & Colquhoun scale, which may be read as a media-studies map of Merleau-Ponty's flesh — the field on which a virtual subject's body image encounters and relates to technical imagery, the common ground on which a spectator hails a hologram into more material being while the hologram also hails the spectator as a fellow specter, a visceral site of Barthes' technically facilitated "contact with death." Friedberg describes virtual imagery as existing within "a separate ontological register, an immaterial form that is functionally but not effectively material," adding that the "slippage" between saying an image is immaterial and yet nonetheless exists before a spectator "signifies a subtle shift in its materiality."[80] Likewise, when the virtual subject reaches out to interact with a virtual entity and finds certain sensory expectations and intentions denied — say, passing a hand through a spectral body that is there but not there — they enter Friedberg's virtual register from

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[78] Gilles Deleuze, "Image-Movement and Its Three Varieties: Second Commentary About Bergson," *SubStance: A Review of Theory and Literary Criticism* 13, no. 3/4 (1984): 86.

[79] Merleau-Ponty, *The Visible and the Invisible*, 135, 142-143.

[80] Friedberg, 9. Her "virtual register" differs from N. Katherine Hayles' "condition of virtuality," which simply describes the distinction between the material and the abstract — and the privileging of the latter — that is endemic to modernity (*How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics* (Chicago: Univ. of Chicago Press, 1999), 18). The "virtual register," as quoted, implies an ontological status for the virtual, one that I'm saying here may transfer between the material and abstract.

the other side, finding themselves to be a material form that is *functionally* but not *effectively* immaterial. Holopresence is thus something of an out-of-body experience — not just a witnessing of a seemingly spectral visual spectacle but, through the phenomenological *intention* of interacting with it, experiencing an actual spectral state of being.

The uncanny un-screening of media

If spectrality seems incommensurable with solid reality, then the experience of holopresence is bound up tightly with historical encounters of the modern uncanny. Casares's fugitive notes that the presence of the island's ghosts "repels and attracts me at the same time,"[81] precisely describing the uncanny's situated mixture of both profound unease and eeriness but also allure and fascination, which has been studied in psychology and literature, notably a century ago by Ernst Jentsch and Sigmund Freud.[82] Freud's writerly psychanalysis was extended potently by Jacques Lacan's application of spatial metaphors to the uncanny, as a "field" where the subject is unable to determine between binary states such as living or dead,[83] while Jentsch's exploration speculates about how the uncanny's characteristic shock and awe may be produced through encounters with specific technical devices and mediated experiences displaying proportional, embodied representations and lifelike animation. Robots were the anchor of Masahiro Mori's landmark 1970 paper proposing the Uncanny Valley — his suggestion of distinct emotional responses to the sight of figures displaying varying degrees of anthropomorphic fidelity — which further extended the uncanny's now-colloquial relationship to

[81] Casares, 32.
[82] Ernst Jentsch, "On the Psychology of the Uncanny," *Angelaki: Journal of the Theoretical Humanities,* 2, no. 1 (1906/1997); Sigmund Freud, "The 'Uncanny'," in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, ed. James Strachey (London: Hogarth, 1919/1955).
[83] Jacques Lacan, *Le Séminaire, Livre X: L'angoisse* (Paris: Éditions du Seuil, 1963/2004).

visual encounters (extensions of which underpin my analysis of a 21st-century "hologram" in Chapter 4). These studies reveal that while the Uncanny Valley response may be an evolved human trait,[84] it is also an experience easily produced through cultural design. Jentsch first identified it as a consequence of "virtuosic manipulation" of visuals and space,[85] in which the oscillation between horror and intrigue is finely tuned through visual displays, affective sounds, and other sensory flavors into the singular experience of the uncanny. More recently, Nicholas Royle's *tour de force* survey of the concept[86] follows suit by historically correlating the rise of the uncanny with a dominance of Enlightenment ideals and the spread of European culture. Flusser's categories do this, too, aligning the experience of late modernity itself to an uncanniness he refers to as *groundlessness*. While Freud describes the uncanny as a space one becomes lost within ("the uncanny would always, as it were, be something one does not know one's way about in"[87]), Flusser's groundlessness is a similar "absence of a point of reference"[88] and "the loss of the models for experience."[89] Again, this is a phenomenological distinction, but one that challenges phenomenology itself by suggesting that even an increase of exposure and learned experience with technical imagery will not eliminate its inherent uncanniness. Merleau-Ponty occasionally refers to such "cases in which the phenomenon does not correspond to the stimulus," but he assures that the uncanny separation from the ground of being may be bridged so that "gradually, by critical labour, the true, present and explicit perception is distinguished

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[84] See Shawn A. Steckenfinger and Asif A. Ghazanfar, "Monkey Visual Behavior Falls into the Uncanny Valley," *Proceedings of the National Academy of Sciences* 106, no. 43 (2009); David J. Lewkowicz and Asif A. Ghazanfar, "The Development of the Uncanny Valley in Infants," *Developmental Psychobiology* 54, no. 2 (2012). Plus, to speculate, being afraid of something that looks human but isn't might once have been (and could still be) a very important evolutionary survival skill.

[85] Jentsch, 12.

[86] Nicholas Royle, *The Uncanny* (Manchester: Manchester Univ. Press, 2003).

[87] Freud, 221.

[88] Flusser, *Into the Universe of Technical Images*, 3.

[89] Vilém Flusser, *Groundless*, trans. Rodrigo Maltez Novaes (Metaflux, 1973/2017), 65.

from phantasms."[90] Flusser, though, says once a subject is made groundless, they become "a spectre surrounded by spectres … a hologram among holograms."[91] In other words, for the holosubject there may be no going back to ground. The essential uncanniness of modern life constitutes a groundless utopia, without fixed reference points, which may evolve either negatively, toward discursive ideological controls, or positively, toward dialogic communication. The only subject equipped to negotiate meaning between the two possibilities is one who has been spectralized for encounters with technical imagery, especially holograms — whose concurrent unease and intrigue is generated not only by the sight of a spectral figure but by the additionally strange experience of feeling themselves to be ghostly.

The collapse of the real-virtual binary heralded by technical imagery simulates a similar uncanny discovery of groundlessness. The newly mixed reality of holopresence, though, is not merely a combination of real bodies and virtual images within real space; it is a combination of the spaces that contain both the bodies and the images. Holograms are often discussed as if they, too, are Enlightened, liberated individuals freed from the confines of surfaces and screens. Reports of AR and hologram research and development routinely are powered by this discourse, heralding 3D imagery with declarations about holograms being "liberated from such devices"[92] and headlines hawking, "Holographic system lets designers escape the screen."[93] (I myself will struggle against succumbing to similar discourse amid Chapter 3's analysis of science-fiction hologram characters and their own dialogues about accomplishing, as an inalienable right, exactly this.) In holopresence, however, the screen is not left behind; rather, it imbues and

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[90] Merleau-Ponty, *Phenomenology of Perception*, 9, 13.

[91] Flusser, *Groundless*, 38, 41. Even here, Flusser is writing less of a technically determined state experience and more of an emerging state of being — one so endemic to the course of his own particular lifetime that he titled his memoir *Groundless.*

[92] Mike Elgan, "The Future of 3d Holograms Comes into Focus," *Computer World*, Jan. 20 2018.

[93] Sun Kim, "Holographic System Lets Designers Escape the Screen," *ZDNet*, Aug. 19 2012.

infuses everyday reality. What comes "off the screen," essentially, is not only its imagery but *the screen itself*. Instead of being populated by framed screens looked at by viewing subjects in the world, the world of holopresence *becomes* a screen, a technically mediated phenomenal field of more complex interactions between technical imagery and its viewing subjects. Actual space and the *actualized* space *of* the hologram are conjoined. As Rosemary Jackson at the Museum of Holography observes in Chapter 2, holograms "exist in their own space which exists in real space (as space). It is sometimes very difficult to tell where one volume stops and the other begins."[94]

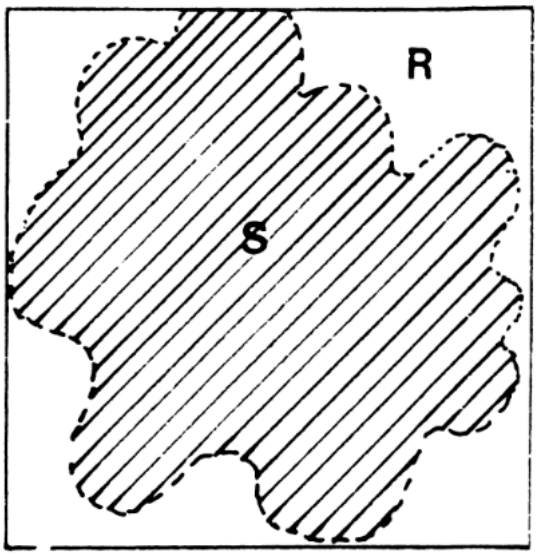

Figure 0.2. Lentini's diagram resituates the shape of the evolving technical-image screen and its emerging relationship to the viewing subject. Rather than remaining contained within a television, film, or digital frame, technologies producing imagery more like holograms allow the screen (S) to spill out into reality (R), vying for spectator attention by actually obscuring that reality.

[94] Exhibit catalog essay, "Enter Holography (An Announcement and an Invitation)" by Rosemary H. Jackson, Exhibit: *Through the Looking Glass* (Dec. 8, 1976-Feb. 27, 1977), Box 37, File 1143, Museum of Holography archives, MIT Museum, Cambridge, Mass.

In an extraordinary 1991 paper,[95] an architect, Luigi Lentini, speculating on the social impact of hologram imagery projected into public spaces, visualizes an idea of the screen's infusion into reality in a diagram reminiscent of the 1958 science-fiction movie *The Blob* (**Figure 0.2**), showing an amorphous "Screen" loosed from its traditional rectangular boundaries and oozing into, over, and throughout "Reality." Like victims of the Blob, the viewing subjects standing in "Reality" are dissolved into the new solution of the *real virtuality*, heralding what Lentini describes as a complete "dematerialization of the observer" through interactions with technical imagery that require that observer to become "progressively disembodied."[96] The holosubject, then, may not easily exit the virtual simply by averting their eyes from the screen, because the screen is now potentially everywhere.

The political implications of this are significant in that, as Lentini's model shows, the screen in reality may not always be transparent — the holograms of science fiction labor exhaustively to erase their spectrality and boost their solidity, and contemporary research likewise struggles to project holograms that are not only opaque but haptic[97] — and thus may act in the world not just by mixing into its spaces but by veiling or concealing them. Philosopher and critic Slavoj Zizek has noted that this defining function of augmented-reality technologies is

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[95] Luigi Lentini, "Private Worlds and the Technology of the Imaginary: Effects of Science and Technology on Human Representations and Self-Conceptions," *Leonardo* 24, no. 3 (1991). Lentini, a Costa Rican architect, has not published much, and this paper is tangentially related to his field. However, appearing in the revered and respected *Leonardo* journal (which boasts a lengthy list of articles about several aspects of holography and 3D art throughout its publication history), I would position this paper as one of the crown jewels of holopresence literature.

[96] Ibid., 334.

[97] For studies of haptic holograms, see Wendy J. Plesniak and Michael A. Klug, "Tangible Holography: Adding Synthetic Touch to 3d Display," *Proc. SPIE 3011, Practical Holography XI and Holographic Materials III* 53 (1997); Hiroshi Ishii, "Tangible Bits: Designing Seamless Interface – between Digital and Physical" (paper presented at the cast01 // living in mixed reality: Conference on Communication of Art, Science and Technology, Sankt Augustin (Bonn), Sept. 21-22, 2001 2001); Graham Wilson et al., "Perception of Ultrasonic Haptic Feedback on the Hand: Localisation and Apparent Motion," in *Proceedings of the 32nd Annual Acm Conference on Human Factors in Computing Systems* (2014).

inherently ideological.[98] "Ideology is the practice of augmenting reality," Zizek writes in a study of the AR game Pokemon Go, elaborating:

> Instead of taking us out of the real world and drawing us into the artificial virtual space, it combines the two; we look at reality and interact with it through the fantasy frame of the digital screen, and this intermediary frame supplements reality with virtual elements which sustain our desire to participate in the game, push us to look for them in a reality which, without this frame, would leave us indifferent. Sound familiar? Of course it does. What the technology of Pokémon Go externalizes is simply the basic mechanism of ideology — at its most basic, ideology is the primordial version of "augmented reality."[99]

This returns us to the philosophy of Vilém Flusser, through which I am situating holograms as an enhanced, emboldened iteration of a form of communication he calls technical imagery. Flusser's commuicology deals directly in power relations: the establishment of writing gave power to literates and tamed the "magic" holism of traditional images, while technical images now threaten the linearity of the textual, historical world by reviving some of that "irrational" magic in the production of knowledge. Flusser recognizes the technical image's potential for communicating discursive ideologies — for overlaying diverting content onto reality, per Lentini's opaque, intrusive blob — but this potential is not weighted in his category; rather, Flusser holds that technical images also provide a (perhaps greater) potential for dialogic

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[98] Of course, the ability of certain technologies, particularly electronic media, to communicate and institutionalize ideological perspectives long has been a focus of media studies and film studies. See Raymond Williams, "The Technology and the Society," in *Television: Technology and Cultural Form* (New York: Routledge, 1974/1990) for a foundational perspective on technology's participation in the construction of social relations and facilitation of knowledge production. Media are not neutral in their delivery of information (Marshall McLuhan, *Understanding Media* (New York: McGraw-Hill, 1964); Marshall McLuhan, "Technology and Political Change," *International Journal* 7 (1952)), and Western media studies (beginning in the 1960s) and medium theory (from the 1980s) have examined specific ways that messages and the meanings made from them are shaped by the mechanism delivering them (Eisenstein, ; Walter Ong, *Orality and Literacy* (London: New Accents, 1982); Neil Postman, *Amusing Ourselves to Death: Public Discourse in the Age of Show Business* (New York: Penguin, 1985)). Film studies in the 1970s focused on this potential for technological determinism and, in particular, critiqued film's essential potential for social control. See Louis Althusser, *On the Reproduction of Capitalism: Ideology and Ideological State Apparatuses*, trans. G.M. Goshgarian (London & New York: Verso, 1971/2014); Jean-Louis Baudry, "Ideological Effects of the Basic Cinematographic Apparatus " *Film Quarterly* 28, no. 2 (1975).

[99] Slavoj Zizek, *Incontinence of the Void: Economico-Philosophical Spandrels*, Nov. 7 ed. (Cambridge, Mass. & London: MIT Press, 2017), 114.

communication — as I read him, a metaphorically holographic potential to view a message from multiple dimensions and perspectives, an emerging practice which hails a subject who not only knows to move in order to view these but also possesses the mobility to do so. His optimism toward enacting dialogic communication through the electronic media and digital networks he experienced prior to his death in 1991 presages the optimism that fueled the development and deployment of the global internet and social media.[100] He is not a digital prophet, however, and his speculations of an electronically mediated future waver between bleak warnings of a "totalitarianism of the apparatus" and a recurring notion that something like open-access, inclusive, networked media could foster the dialogic communication he saw as a significant tool for winning and maintaining human freedom.[101] As technical images concretize and make visible the spectralities of existing ideologies, learning to how to "read" them is vital to the kind of media savvy Flusser says is necessary to see not only the message itself but how it is being communicated, who is programming it, and why it is projected into the world. Learning to live with these technical ghosts — to see the specters and see *through* them — would highlight technical imagery's dialogic rather than discursive effect.

[100] In Chapter 2, I discuss how Flusser's thinking here connects with or parallels not only discourses foundational to internet expansionism — as explored in Fred Turner's histories of American digital utopianism: *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago & London: Univ. of Chicago Press, 2006); Fred Turner, *The Democratic Surround: Multimedia and American Liberalism from World War Ii to the Psychedelic Sixties* (Chicago & London: Univ. of Chicago Press, 2013) — but also the countercultural ideals of many aesthetic holographers.

[101] Flusser, *Into the Universe of Technical Images*, 170. For example, "Dialogic threads (such as cable, videophones, or conferencing video) could open the fascist tissue of the rising society to the kind of web we are in the habit of calling 'democratic.' And if such a web was actually constructed and images installed according to such a pattern, one could no longer speak of isolation and political coordination. For then people of the future would truly be in dialogue, in a global conversation" (ibid., 64).

Chapter outlines

The following dissertation seeks to chart emergences of the holopresence described above through four historical cases across nearly 150 years. In Chapter 1, I locate a formative early experience of holopresence in the production and presentation of the Pepper's Ghost stage illusion during the 1860s at the Royal Polytechnic Institution in the heart of Victorian London. Amid the institute's ideological efforts to promote the value of Enlightenment modernity and rational science, John Henry Pepper's adaptation and scaling of an optical illusion for the specific presentation of ghost imagery for instructive amusement both accomplished what he intended *and* had a lasting additional effect that reverberates at the core of contemporary media experience. While he intended his demonstration to showcase the fraud of spiritualist mediums and the superiority of rational technoscience, his requisite reveal of the ghost imagery as technically produced relocated the spectral from a supernatural experience to a natural one. Rather than eradicating superstition among modernizing Britons, Pepper's Ghost beautifully staged and performed this transformation for thousands of visitors, effectively training a large population in the naturalization of spectral encounters via technology. Pepper's practices contributed to the formation of the holosubject, a spectator accustomed to scientifically mediated encounters between bodies and specters and an uncanny state Terry Castle refers to as "enlightened bewilderment"[102] — a specific perplexity that arises when rational inquiry is confounded by irrational evidence, creating a clash of epistemes.

While the Polytechnic attempted to utilize the spectacle of its illusion for scientific and ideological instruction, the Museum of Holography (MoH) in New York City a century later took a new scientific visual object — the optical hologram — and worked to reframe it not only

[102] Terry Castle, *The Female Thermometer: Eighteenth-Century Culture and the Invention of the Uncanny*, ed. David M. Halperin, Ideologies of Desire (New York & Oxford: Oxford Univ. Press, 1995), 19.

as an aesthetic object but as an icon of an emerging postmodern communication form. Chapter 2 examines this emergence of holopresence during the 1970s through direct interactions between spectators and the spectral, technical imagery displayed by the museum. At the Polytechnic, the holosubject existed not in its audiences but on its stage, Pepper's Ghost being a demonstration of such an interaction; at the MoH, spectators of holograms were hailed as this new kind of viewing subject, acting on the stages of its galleries on order to learn methods of interacting with embodied imagery. In this chapter, I examine floorplans of exhibit spaces and texts displayed throughout MoH galleries for ways they constructed both a developmental concept of the holosubject and a space in which that subject could be actualized. Ultimately, the MoH operated as a visceral training ground for the liminal interaction inherent to the holographic image, one embodied by the viewing subject's physical mobility but also disembodied by the gesture of holography — the reaching hand that finds no solid purchase — and the spectator's experience of a degree of spectrality themselves.

During the same decade, however, ideas about desires for the experience of holopresence began to supersede the technical ability to realize them. Chapter 3 follows the conceptual transition of the optical hologram into the digital "hologram" within science-fiction narratives, in which the form of an embodied, spectral human figure becomes a cultural imaginary — specifically, a form of "imaginary media" as defined by Eric Kluitenberg.[103] Like *The Invention of Morel*, the scifi novella with which I introduced this project, speculative novels, films, and television narratives began depicting humans interacting with and often living among subjects who were technical-image projections of digital systems and artificial intelligences. Within these texts, the visual figure of the optical hologram transmutes into the digital "hologram,"

[103] See Kluitenberg, "On the Archaeology of Imaginary Media," ; Kluitenberg, "Second Introduction to an Archaeology of Imaginary Media," .

transforming the same term into an object with a vastly different denotation but — crucial for my analysis here — many of the same previous connotations. Through critical description and theoretical analysis of selected storylines and characters within two prominent, transmedia scifi franchises, *Star Wars* and *Star Trek*, this chapter illuminates and critiques a specific step along the evolutionary trajectory of holopresence media, one in which the holosubject returns to the performance space as a pedagogical demonstration of the physical, technical potential and futuristic inevitability of interactions with technical specters common to holopresence discourse.

Since the scifi concept has become a fixed imaginary, continuing efforts to produce "a Princess Leia hologram" — or at least something that resembles it — have attempted once again to actualize the experience holopresence in the real world, including augmented-reality technologies, which simulate the *real virtuality* examined in this study as opposed to strict virtual reality. My final chapter examines one such case — which happens to be the return of Pepper's Ghost in the 21st century, in the form of a digital upgrade to its basic 19th-century design in order to project the likeness of a deceased pop-music performer back onto a stage. Specifically, I analyze spectator reactions to the Tupac "hologram," a digital animation of the late rapper Tupac Shakur projected as part of a live music concert in 2012. Combining the illusory effect of the original Pepper's Ghost with the digital-projection context of the scifi imaginary, the Tupac "hologram" performance presents both a continuing demonstration of how bodies might interact with technical specters — as Tupac exchanges greetings and rhymes with onstage compatriots — and a live interaction space that affords spectators that experience. At the Tupac concert, the holosubject was both on stage *and* in the crowd, both emerging and learning about what their social role interacting with a technical specter in a particular context might be. These expressions of immediate, phenomenological reaction to this visual spectacle surface complex struggles to

make sense of the uncanny, to negotiate spiritual and spiritualist belief, and to parse a recognizable identity of a human figure from various cues as to its race, gender, and other identity categories. Ultimately, like the original Pepper's Ghost, spectators accept the presence of this projected dead figure — not his body but his already recognizable media persona, as Philip Auslander has extended the performative concept[104] — as real *enough* to allow it to pass within the familiar context of the concert stage.

I conclude by looking at the present moment and into the futures available to emerging holopresence technologies. As this dissertation is being concluded amid the worldwide coronavirus pandemic, I connect recent struggles with the authenticity and affective satisfaction of available virtual communication options to the parallel discourses of holopresence, and I account for several examples during the previous year of hologram technologies considered as viable means to counter "Zoom fatigue" and boost certain wavelengths of an absent person's physical presence. I briefly consider other current projects in which holograms are designed and promoted as tools for the extension of personal presence but also of personal narrative and ideological participation, such as the New Dimensions in Testimony effort to fashion holograms of Holocaust survivors for the purpose of continuing to tell *their* stories after dying. The hologram's embodiment of the dead, in this way, is a new technical iteration of Jeremy Bentham's utilitarian *auto-icon*, the situation of the posthumous body back into social exchange.

[104] See Auslander, ; Philip Auslander, "On the Concept of Persona in Performance," *Kunstlicht* 36, no. 3 (2015); Philip Auslander, "Musical Personae," *TDR: The Drama Review: A Journal of Performance Studies* 50, no. 1 (2006).

Chapter 1:
Pepper's Ghost and the technical situation of spectrality

> I reckon that if there were such a thing as a ghost in Europe, we'd have it at home in a very short time in one of our public museums, or on the road as a show.
> — Oscar Wilde, *The Canterville Ghost*

My first case of holopresence — not *the* first, perhaps,[1] but the most historically significant, technically detailed, and widely deployed — was Pepper's Ghost,[2] a version of a common optical illusion scaled up for the stage by a lecturer of popular science at the Royal Polytechnic Institution, a museum and attraction in Victorian London. Its namesake, John Henry Pepper, used the illusion as he did many other performative spectacles in his scientific lectures and demonstrations for a specific ideological purpose: to manifest a seemingly supernatural sight in order to then reveal and celebrate its utterly natural origins. At the "Poly," dazzling attractions included great electric sparks filling the air above audiences, which alarmed the crowds until the lecturer revealed the coils producing them (and his control of them), and imagery of scary

[1] David Brewster — an idol of Professor Pepper's, and a primary source of contemporary knowledge about the optical effects Pepper would recognize underpinning the Ghost illusion — wrote about the use of similar apparitions used for "magical effect" in the ancient world and even during the Middle Ages "as an instrument of imposture" (*Letters on Natural Magic* (London: Chatto & Windus, 1832/1883), 145, 137). "It can scarcely be doubted," he declares (without offering historical evidence), that concave mirrors had been used at ancient oracles and early religious power sites to control people with illusions "of an optical nature," by making images of gods and godlike figures appear to spectators (ibid., 146, 138). As explored below, the Polytechnic's disdain for fraudulent illusions was focused on its own historical moment but also retroactively. Polytechnic exhibits, as reported in the press, were "calculated to expose the frauds and illusions of demonism and witchcraft, both in ancient *and* modern times" ("The Theatres, etc.," *Illustrated London News*, Oct. 10, 1857, p. 363 'Photocopies of extracts from the Illustrated London News,' 7-21-1, Royal Polytechnic Institution archives, University of Westminster, London.).

[2] Nearly all scholarly and popular sources on this subject capitalize only Pepper's name in referring to this particular illusion ("Pepper's ghost"). In this work, I will be capitalizing both terms — as illusionist and historian Jim Steinmeyer also does (Jim Steinmeyer, *Hiding the Elephant: How Magicians Invented the Impossible and Learned to Disappear* (New York: Carroll & Graf, 2003); Jim Steinmeyer, *The Science Behind the Ghost!* (Burbank, Calif.: Hahne, 2013)) — when referring to the specific illusion as arranged, modified, and exhibited by Pepper and others as Pepper's Ghost. The illusion was not just any ghost belonging to Pepper; it is a specific technical apparatus. Also, as the object of a fair amount of patent controversy, the fully capitalized Pepper's Ghost duly sets it apart as a singular, identifiable, and trademarked media experience.

monsters projected onto a screen, which revolted audiences until the scientist revealed their source (projected magnifications of the local tap water) and relative harmlessness. In this company, Pepper's Ghost was an illusion created to mimic superstitious notions of supernatural ghosts so that the Polytechnic lecturer could then calm frightened viewers by revealing the ordinary, technical means of their production (and his control of them). Pepper's intent was to further the Enlightenment discourse of demystification — the idea that the knowledge produced through superior technoscience would eradicate irrational superstition from society. Instead of an epistemic exorcism, however, Pepper's Ghost merely participated in resituating the experience of the spiritual from one of supernatural manifestation to one of technical conveyance. But in so doing, viewing subjects at the Polytechnic were shown a demonstration of holopresence and the potential interaction between a human subject and a projected ghost. They were not yet holosubjects themselves, but spectators in the Polytechnic's theaters received a first and somewhat pedagogical glimpse of what encounters with modern visual media might be like.

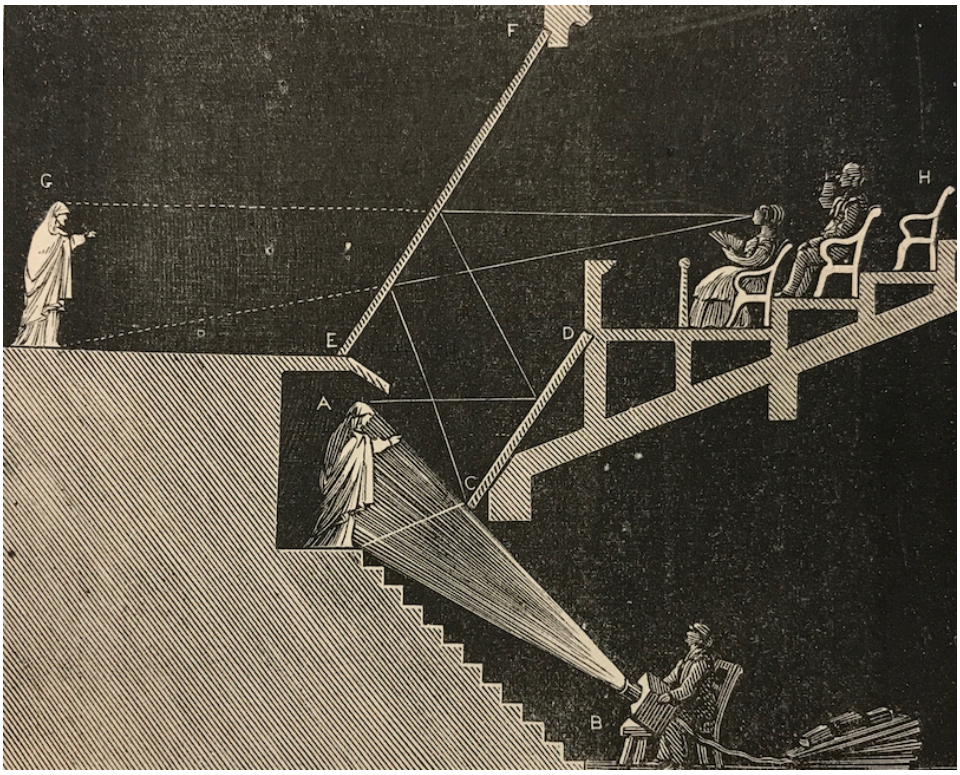

Figure 1.1. This illustration from a science manual[3] shows Pepper's ultimate adaptation of the optical illusion for theatrical stages. An actor (A) is positioned just below the audience's sightline (H), and is illuminated by an oxyhydrogen lamp from below (B). A mirror (C-D) reflects the actor's image onto a pane of glass (E-F) so that the image of the actor appears to be a body on the stage (G).

The Pepper's Ghost illusion (**Figure 1.1**) operates by carefully tuning glass, mirrors, and light in order to project the image of an absent (offstage) object or person before a spectator (onto a stage) as if they are present with them. The apparatus is purposely hidden from spectators so that they might focus on the image and (lacking the usual surface or framing context for an image) thus initially believe it to be a thing or a person present with them. The optics of this illusion were well-known before Pepper refined them into the theatrical spectacle at the

[3] Robert Routledge, *Discoveries and Inventions of the Nineteenth Century* (London: George Routledge & Sons, 1903), 278.

Polytechnic and beyond.[4] When using it to manifest the proportional imagery of a person onto a stage, as Pepper did, his carefully positioned audience simply saw two people appear to be present there. But the ordinary sight becomes a spectacle when one of them, say, passes a hand or a weapon *through* the other, and the other remains undisturbed — becoming quite suddenly othered, revealed to be somehow present but not, visible (like an image) but not solid (like a body).

The act creates a deeply uncanny experience that challenges everyday assumptions and expectations of sight and space, materiality and presence. Given that many human cultures possess concepts of ghosts (their appearance and behavior), the immediate assumption (particularly for the largely Judeo-Christian audiences at the Polytechnic) is that the other figure is just such a phantom. It is an assumption the stage narrative usually relies, if not depends, upon, and it is one that Pepper sought to socially engineer. Professor Pepper[5] — aligned with the

[4] The illusion on which Pepper's Ghost is based stems from a common experience. Hold a candle and approach a window at around twilight; you will see your own image appear in the window glass, and that same indistinct image will be superimposed over (or into) the outdoor scene. The glass is transparent, but it also reflects. Clarifying and tuning both operations at once constitutes the foundational secret of Pepper's Ghost. Knowledge of its basic operation had been written about as early as John Baptista Porta's 1558 book *Natural Magic* in a chapter titled "How We May See in a Chamber Things That Are Not," in a brief description of a chamber with a window on one side, into which a spectator looks and sees objects that are actually reflected from a chamber above (*Natural Magick* (London: Thomas Young and Samuel Speed, 1658), 370, which was translated into English exactly a century after its original publication in Italy). Nothing performative is suggested in this description beyond a simple optical curiosity. In addition, Brewster covers similar trickery in works published around the time of the Polytechnic's opening, claiming that such visuals directly inform "the modern phantasmagoria" of the mid-19th century (Brewster, 93). A later edition of *Letters* includes extra chapters written by its editor, J.A. Smith, one of which details the specific Pepper's Ghost illusion, claiming it as a direct result of Brewster's optics work as well as calling Pepper's version "very ingenious and perfect" (ibid., 403). In addition, a decade prior to Pepper's presentation of his Ghost, French artist Pierre Séguin filed an 1852 patent for a toy utilizing the illusion. Séguin's Polyoscope was a hand-held viewing box, in which a spectator would see only darkness until turning knobs that let in light and revealed objects that appeared to be in the box. In his memoir about the ghost spectacle, Pepper mentions having seen a Polyoscope in Paris years after premiering the illusion in London (*The True History of the Ghost, and All About Metempsychosis* (London, Paris, New York & Melbourne: Cassell & Co., 1890), 24).

[5] He was commonly called "Professor Pepper," though his scientific credentials (like many of the Victorian era's popular scientists) were loosely acquired, with the title of Professor of Chemistry conferred upon him by the Polytechnic's board "rather than a university" (Bernard Lightman, *Victorian Popularizers of Science: Designing Nature for New Audiences* (Chicago & London: Univ. of Chicago Press, 2007), 213); he nonetheless defended this against indignity, assuring readers of his memoir that the honorific "was not that of a hair-dresser or dancing master, but was conferred upon him by express minute of the Board of Directors" (Pepper, 2; portions of Pepper's memoir

Polytechnic's mission to promote the superiority of rational science and new technologies — worked to maintain the performative awe but to transfer it from supernatural wonder to natural amazement. He did this by routinely extending each presentation of the spectacle to a crucial third step: revealing to the audience the technical system producing the illusion, in order to showcase and celebrate the science producing the specter. This extra step and its built-in intention to transfigure supernatural spectacles into natural magic is a key aspect of each of this dissertation's other cases of holopresence. But the reveal of a ghost's technical origin redirects rather than removes the spectral from a spectator's experience of such a spectacle. In the origin story of Pepper's Ghost, a spirit became less of an entity that materializes out of thin air via wizardry and more of an entity manifested specifically through a technical system's harnessing of certain scientific principles. Pepper's grafting of one concept to the other's context did not necessarily demystify European society of pre-modern superstition but rather passed its germ from mediums to media, relocating the source of the spectral and marrying its magic to the technical. Pepper intended for his ghost to assist in driving out specters in favor of rational, scientific explanations of the world's phenomena, but what he helped to accomplish was the spiritual possession of modern media systems — from which, as discussed in my Introduction, ghosts of many forms haunt us still.

In this chapter, I situate the development and use of Pepper's Ghost at the Polytechnic as an early emergence of the technical image, per Vilém Flusser's communication category, and a significant demonstration of the experience of holopresence. While the Pepper's Ghost illusion does not produce an optical hologram in the strict sense of the next century's (and chapter's) coinage of the term, it is an early iteration of a technical image that produces the experience of

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are written in the third person, with no external attribution). Nonetheless, this made him less critical in his scholarly work, as "he was careful not to antagonize eminent scientists" (Lightman, 213).

holopresence, that uncanny communion with a holographically embodied subject. Pepper's Ghost is not electronic or digital, but as I will show, its assemblage of simple visual technologies functions together to project an image into a carefully defined context in which the virtual is made to appear as if it has been released from its (now invisible) frame or screen, like the "real" holograms of the next chapter or the science-fiction imaginary of Chapter 3. This same operation boomerangs back in the 21st century via a revival of Pepper's same basic assemblage (the subject of Chapter 4) — a "futuristic" arrangement of technologies so similar to Pepper's refinements 150 years prior that were he to time-travel to the present and watch Tupac's "hologram" performance he undoubtedly would recognize his own handiwork (and inquire after the patents). Both cases are important bookends for my analysis as public demonstrations of how one might understand and act in the physical presence of a holographically embodied subject. The Polytechnic was a particularly effective training ground for such a viewing subject, as the institute embodied a peculiar tension of modernity that Terry Castle refers to as "enlightened bewilderment"[6] — not just any bewilderment, but a perplexity that arises when rational inquiry is confounded by irrational evidence, creating a clash of epistemes. The Polytechnic attempted to endow viewing subjects with a double vision — able to see the wondrous, seemingly supernatural specter but also to see through it to its technical origins and explanation as a natural phenomenon. The presentation and explanation of Pepper's Ghost, more than most of the

[6] Terry Castle, *The Female Thermometer: Eighteenth-Century Culture and the Invention of the Uncanny*, ed. David M. Halperin, Ideologies of Desire (New York & Oxford: Oxford Univ. Press, 1995), 19. I can't say for *certain* that Castle coined this phrase — she uses it once in quotation marks but without attribution, introducing it rhetorically by saying "one" *might* refer to the uncanny state this way — but she seems to be singular in applying it to this particular sense of post-Enlightenment confoundment. The phrase is deployed previously but in a much different context within an essay by Jürgen Habermas — "Vorwort," in *Die Postnationale Konstellation: Politische Essays* (Frankfurt: Suhrkamp, 1998) — to mean "post-totalitarian caution," as translated by John Torpey in his introduction to the anthology *Politics and the Past: On Repairing Historical Injustices* (Lanham, Md. & Oxford: Rowman & Littlefield, 2003), 1. A handful of other sources cite Castle when using the phrase in the same sense I am.

institute's visual attractions, facilitated this permeability between uncanny awe and rational knowledge and contributed to the construction of modernity's uniquely mixed reality.

The Royal Polytechnic's thoroughly modern vision

The Royal Polytechnic Institution opened on a bustling new London street in 1838, established by Sir George Cayley as "a more scientific form of the exhibition hall so beloved of the inquiring Victorian visitor."[7] Cayley's institute featured a Great Hall stacked with exhibits of scientific demonstrations (e.g., a 30-foot spark from an induction coil, microscopes revealing the creature show inside a drop of London tap water) and galleries of new inventions (engineering machinery, performing automata, a diving bell in an indoor pool). Private citizens could rent laboratory space and receive assistance in completing patent applications. Daily programs included lectures ranging from explanations of recent scientific explorations (into such topics as electricity, magnetism, and chemistry) to reports on the nation's latest military campaigns and technologies. The Poly theaters also presented accounts in which the empire's vast scale and industrial production were connected to everyday domestic realities ("Sugar: From the Cane to the Teacup"[8]) and well-being ("Safety Against Fire and Smoke"[9]). Entertainments included an early and highly creative form of slide show projecting travelogues and naturalist scenes, as well as musicals, poetry readings, and paintings.

The Polytechnic's spatial and temporal positionings contributed significantly to its cultural capital and its status as a figurehead of emerging British modernity. For example, the

[7] Hermione Hobhouse, *A History of Regent Street: A Mile of Style* (West Sussex, UK: Phillimore, 2008), 79.
[8] Advertisement, Polytechnic program, week of July 28, 1873, bound volume of Royal Polytechnic Institution programmes, no. 28, 3-10, Royal Polytechnic Institution archives, University of Westminster, London.
[9] Advertisement, Polytechnic program, week of April 6, 1874, bound volume of Royal Polytechnic Institution programmes, no. B12, 3-11, Royal Polytechnic Institution archives, University of Westminster, London.

Poly's physical location in central London — at 309 Regent Street, in a bustling neighborhood of a metropolis in transition — placed it at the physical heart of numerous similar attractions. Beginning in 1828, visitors could view models of industrial machinery and the telegraph at the Gallery of the National Repository.[10] The Adelaide Gallery, opened in 1832, established a template for scientific exhibition halls that the founders of the Polytechnic emulated and developed.[11] In addition, less overtly instructional visuals were available to the public at the Colosseum, which housed the largest panorama ever painted (an aerial view of the city itself), and the Diorama, a specially built theater that displayed large painted screens with lighting effects that seemed to render them in motion, attractions that often are charted within teleological prehistories of cinema.[12] (The flurry of new museums offering novel visual experiences resembles the colonization of certain New York City neighborhoods by similarly inclined modern artists more than a century later, of which the Museum of Holography in Chapter 2 was a part.) Each of these institutions may be regarded not only for their contents but their larger social function and (in a Flusserian sense) programming. The Polytechnic displayed modern, technical apparatuses, but it also *was* a modern, technical apparatus.

The Polytechnic's particularly potent blend of entertainment and education — described consistently and persistently throughout the London press as "scientific entertainment,"[13]

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[10] Charlotte Sleigh, "Communicating Science," in *The Oxford Illustrated History of Science*, ed. Iwan Rhys Morus (Oxford: Oxford Univ. Press, 2017).

[11] Brenda Weeden, *The Education of the Eye: History of the Royal Polytechnic Institution, 1838-1881*, vol. 1, The History of the University of Westminster (Cambridge, UK: Granta, 2008).

[12] See Erkki Huhtamo's elegant study (*Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles* (Cambridge: MIT Press, 2013)) as well as Jonathan Crary, "Géricault, the Panorama, and Sites of Reality in the Early Nineteenth Century," *Grey Room*, no. 09 (2002) and Richard Balzer, *Peepshows: A Visual History* (New York: Abrams, 1998).

[13] Newspaper clipping, "Royal Polytechnic Institution," unknown source, 1859, 'Press cuttings,' 4-1, p.30, Royal Polytechnic Institution archives, University of Westminster, London.

"instructive and amusing," a blend which occurs "naturally,"[14] a place "for fun as well as science"[15] where "instruction and entertainment go hand in hand"[16] — made it a bastion of "popular science," the 19th century's emerging practices of presenting scientific principles and discoveries for lay audiences with dramatic displays and emotional spectacles. The Victorian era was peopled not just with working scientists but proselytes for it — popular performers who "spoke on behalf of science" and, in these proto-marketing efforts, supplied "the glue for a new worldview."[17] But "the Poly," as it was colloquially known, was truly popular, attracting large London crowds with a remarkable diversity in class and gender.[18] Richard Altick's landmark study of pre-Victorian visual attractions describes this Enlightenment penchant for "education sugarcoated with entertainment," but at the Polytechnic the sugar was not a mere confectionary adornment; it was baked into the institute's perspective and practices. First and foremost, the Polytechnic was a place of science display and popular enlightenment, but the development of performance techniques in the lectures and the insertion of spectacle into the demonstrations amped up the tension between the education and the entertainment. From the perspective of Polytechnic programming, however, this was not an oppositional binary. Programs routinely

[14] Both in "Notices of the Press," Polytechnic program, week of May 1, 1876, bound volume of Royal Polytechnic Institution programmes, no. 172, 3-14, Royal Polytechnic Institution archives, University of Westminster, London.
[15] Quoted in "The Easter Programme," Polytechnic program, week of May 11, 1874, bound volume of Royal Polytechnic Institution programmes, no. B17, 3-11, Royal Polytechnic Institution archives, University of Westminster, London.
[16] "Opinions of the Press," Polytechnic program, week of June 19, 1876, bound volume of Royal Polytechnic Institution programmes, no. 182, 3-16, Royal Polytechnic Institution archives, University of Westminster, London.
[17] Lightman, 5.
[18] New commercial centers like Regent Street were where the "clash of old and new, rich and poor, well-to-do and trade became the centre of the new urban culture, a dynamic mix of shopping, promenade and entertainment" (Ro Spankie, "The 'Old Cinema': A Dissolving View," in *The Magic Screen: A History of Regent Street Cinema*, The History of the University of Westminster (London: Univ. of Westminster, 2015), 23). The Polytechnic drew upon and focused this vibrant social mix. The only separation was a members-only entrance in the rear, off the tonier Cavendish Square, while the general public entered via bustling Regent Street. Despite different entryways, once inside "all ages and classes rubbed together" united by their stoked curiosity (Richard D. Altick, *The Shows of London* (Cambridge and London: Harvard Univ. Press, 1978), 3).

billed Polytechnic fare as "rational enjoyment"[19] and the institute itself as "a place of popular science and harmless amusement."[20] The consistent communication of the idea that science was a thrilling, spectacular affair signaled the mixed-reality on offer from this sturdy social antenna of Enlightenment values.

While Polytechnic scientific programming was not opposed to entertainment, it was opposed to *something* — defining itself and its mission through that opposition per the practices of the emerging modern attitude. The institute's targets were irrationality, magical thinking, and superstition (if not necessarily religion[21]). The presentation of ghost conjuring at a museum

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[19] "Under New Management," Polytechnic program, week of Aug. 2, 1875, bound volume of Royal Polytechnic Institution programmes, no. 133, 3-13, Royal Polytechnic Institution archives, University of Westminster, London.

[20] "Notice," Polytechnic program, week of Aug. 22, 1881, bound volume of Royal Polytechnic Institution programmes, 3-23, Royal Polytechnic Institution archives, University of Westminster, London. The original name of the Royal Polytechnic communicated its Janus-like mission: the Gallery of Arts and Sciences. Queen Victoria's coronation had taken place just five weeks before the opening (her titular age was not yet underway) and she wouldn't grant the institute its royal charter for another year. Additionally, the term "scientist" had been coined only five years earlier (See Sydney Ross, "Scientist: The Story of a Word," *Annals of Science* 18 (1962)) to describe the type of professional who would be providing explanations on tours of the Polytechnic galleries and leading experimental demonstrations on its stages. Thus, the job title had not cemented into anything we might recognize today as being freer of showmanship and popular appeal. It's not that the Poly lecturers blurred a line between education and entertainment; it's that in these newly emerging popular spaces and before the formalization of public education, a line did not exist to blur. Pepper attempted only a few middling efforts at formal education, some of which included testing and certification for chemists and train conductors, but the Poly's goals for instruction were ideological, not didactic. Pepper's lectures on the chemistry of the sun, for instance, were not meant to return spectators to the London streets spouting the specifics of hydrogen-helium fusion; rather, they were meant to go forth declaring the majesty and authority of Enlightenment methods. A book by another Polytechnic lecturer assures in its first sentence that "we do not propose attempting to make our readers proficients in science" (James Wylde, *The Magic of Science: A Manual of Easy and Instructive Scientific Experiments* (London & Glasgow: Richard Griffin & Co., 1861), 1, 4-5, Royal Polytechnic Institution archives, University of Westminster, London). Polytechnic events were designed, as Arjun Appadurai describes such processes, "to create persons who would, after the fact, have wished to have become modern" (*Modernity at Large: Cultural Dimensions of Globalization*, vol. 1, Public Worlds (Minneapolis and London: Univ. of Minnesota Press, 1996), 1). The Polytechnic meant to take in un-Enlightened, superstitious Britons and turn out modern, science-*minded* people.

[21] Polytechnic demonstrations of science, even its efforts to debunk spiritualist ghost conjurings, were not attacks on religion itself. The history of science is thoroughly entangled with religious figures, discourses, and practices — from Newton calculating the Bible to Jung throwing the I Ching — and these cross-currents haunted the assertion of scientific dominance practiced by the Polytechnic. Pepper himself was profoundly religious, a Catholic convert in Protestant England (a socially risky move and thus indicative of commitment), who repeatedly referenced God in his books and, according to Edmund Wilkie's posthumous memoir of him, routinely closed his Polytechnic lectures on astronomy by raising his arms and quoting from Psalms: "The Heavens declare the Glory of God, and the firmament showeth His handiwork" (Edmund H. Wilkie, "Professor Pepper: A Memoir," *The Optical Magic Lantern Journal and Photographic Enlarger* 11, no. 133 (1900): 74). Any social contrast between the goals of science and the function of religion developed after the full lifespan of the Polytechnic, a contrast which historian Peter Harrison claims became "important for the integrity of the boundaries of science" (*The Territories of Science and Religion*

hawking rational modernity may seem ironic, but it fit the script of the institute's efforts to evert superstition *into* scientific thinking — to reprogram one epistemic function for another. Rewriting pre-scientific explanations of the world was a consistent practice in the Polytechnic's promotion of its worldview. One of its most popular entertainments, for instance, was *Zitella*, a musical pantomime that retold the folk tale of Cinderella "in a modern fashion" by recasting the stepsisters as women "learned in mathematics" who force the younger girl to solve complex equations rather than scrub floors; *Zitella*, instead, scrubs the story of fairytale magic but leaves its heroine's wondrous transformation intact.[22] Pepper's Ghost simply was another example of the Polytechnic's recoding of culture in service of these same rational discourses.

Such work requires able storytellers and performers, and Pepper was both — a science-minded man with a seemingly natural gift for Barnum-esque razzle-dazzle that led him to become "one of the premier showmen of science"[23] during this era or, in more contemporary parlance, "the celebrity chef of Victorian science."[24] A chemist by training, Pepper arrived at the Polytechnic to lecture about chemistry in 1847, eventually becoming the institute's director just a few years later. Much of the Polytechnic's reputation and practice as a showy showcase for modern technoscience can be credited to Pepper's programming and presentation, which became

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(Chicago: Univ. of Chicago Press, 2015), 187). That recoding, however, was in process as the Poly pressed its modernizing campaign; its lecturers largely remained religiously reverent but science-minded men who saw their work as revelations of the natural world *that was God's creation*. As German philosopher Paul Carus wrote, "When magic becomes discredited by science, religion is purified" (quoted in Mike Caveney, "From Black Magic to Modern Magic," in *Magic, 1400s-1950s*, ed. Noel Daniel (Cologne: Taschen, 2015), 105).

[22] Reviews of *Zitella* celebrate it for precisely this achievement: how it "boasts of a higher aim" than standard London entertainments, how it features "whimsical reference to the technical terms of modern science," and how the Polytechnic version is assuredly "a story of the day" (all quoted in "'Zitella' — Opinions of the Press," Polytechnic program, week of Aug. 17, 1874, bound volume of Royal Polytechnic Institution programmes, no. B31, 3-12, and "'Zitella' — Opinions of the Press (Second Notices)," Polytechnic program, week of Oct. 26, 1874, bound volume of Royal Polytechnic Institution programmes, no. B41, 3-12, Royal Polytechnic Institution archives, University of Westminster, London).

[23] Lightman, 200.

[24] J.A. Secord, "Quick and Magical Shaper of Science," *Science* 297 (2002): 1648.

the institute's *modus operandi* for its remaining decades.[25] As Lightman observes, Pepper's "influence was pervasive. His lecturing inspired budding young scientists,"[26] and he was valued as the ultimate emcee for the institute's mission to project its modern ideas about reality onto the everyday experience of its patrons.

Pairing science with technical imagery Polytechnic performance

The historical positioning of the Polytechnic situates it as a nascent landmark within an emerging technological media culture in Europe. As discussed in my Introduction, between the arrival of photography in the 1820s and the establishment of cinema by the end of the century, Western standards of visual representation were very much in flux, and a variety of new visual experiences — from the social experience of large panoramas and dioramas to the more intimate stereoscope and zograscope — were presented to the public. The Polytechnic was an active player amid London's own "frenzy of the visible,"[27] a central showcase of new visual technological marvels. The very lifespan of the Polytechnic correlates with a period from the beginning of photography to the dominance of cinema, and the institute was a site of firsts for both: The first photography studio in Europe opened on the Polytechnic rooftop in 1841 and

[25] See Weeden, 1. The Royal Polytechnic Institution became the University of Westminster in 1992.
[26] Lightman, 203.
[27] Jean-Louis Comolli, "Machines of the Visible," in *The Cinematic Apparatus*, ed. Teresa de Laueretis and Stephen Heath (London: Macmillan, 1980), 122.

became a highly popular attraction,[28] and the Polytechnic was the location of Britain's first screening of the Lumiéres' Cinématographe in 1896.[29]

The Polytechnic was a magnet for visual curiosities because its specific practices overtly indulged and focused an ocularcentrism peculiar to the Victorian era. While the London press faithfully parroted the institute's mission statements about the "instructive amusement"[30] to be had at the Polytechnic, its reporting also brings into focus a chief aspect of the experience of a Poly lecture or demonstration: the "vast amount of ocular gratification"[31] to be found there. The Polytechnic's own mission statements promise to provide visitors with greater understanding of the scientific discoveries and new inventions that were changing their Western, industrial lives — but specifically to *show* them. An early Polytechnic catalog declares, "The education of the eye is, undeniably, the most important object in elementary instruction" and promises that the virtues of science would be "made palpable by exhibition" and this would leave with the spectator "a valuable and durable impression."[32] This would be accomplished not merely by the droning sound of a lecturer's voice or by an individual's experience with a text but by a more performative visual spectacle — palpable and impressive. The Polytechnic building contained galleries and theaters, not classrooms and lecture halls. Everything at the Poly was situated

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[28] Elaine Penn, "Introduction," in *The Magic Screen*, The History of the University of Westminster (London: Univ. of Westminster, 2015). Photography was referred to in Polytechnic programs as "the interesting Art of Sun Painting," and visitors could have portraits made in the brightly lit photo studio on the institute's top floor ("Photographic Specimens" advertisement, Polytechnic program, week of March 27, 1876, bound volume of Royal Polytechnic Institution programmes, no. 167, 3-14, Royal Polytechnic Institution archives, University of Westminster, London).

[29] The Royal Polytechnic Institution closed in 1881, but the property was purchased and reopened the following year by educational reformer Quintin Hogg as the Regent Street Polytechnic, a continuation of his previous and more directly educational project, the Young Men's Christian Institute.

[30] Photocopy of newspaper page, "Polytechnic Institution," *The Times (London)*, July 13, 1867, 'Photocopies of news articles from The Times,' 7-21-8, Royal Polytechnic Institution archives, University of Westminster, London.

[31] Newspaper clipping, "Polytechnic Institution," unknown source, 1856, 'Press cuttings,' 4-1, p.26, Royal Polytechnic Institution archives, University of Westminster, London.

[32] Polytechnic catalog, "The Royal Polytechnic Institution," 1844, pp. 5-6, '1844 Royal Polytechnic Institution Catalogue,' 3-4, Royal Polytechnic Institution archives, University of Westminster, London.

especially to be seen, looked at, gawked at. The Times noted the visual assault: "There is scarcely a fact recorded that is not illustrated by a picture, or a principle stated that is not elucidated by a diagram, so that if the ears of the spectator refuse to receive the information, which is clearly, eloquently, and sometimes even humourously given by Mr. Pepper, his eyes can scarcely refuse the intellectual nutriment."[33] Other newspapers practically parroted what could have been a Polytechnic mantra: "The eye is delighted while the mind is improved."[34]

One of the primary visual technologies providing this illustration at the Polytechnic was an early kind of slide show called "dissolving views," manifested with slide projectors called magic lanterns. Throughout the 1850s, Pepper, in particular, mastered this particular visual communication tool— indulging his self-confessed "habit" of using the lantern "for illustrating my lectures" at the Polytechnic[35] — and several of his lantern techniques would inform the design and staging of Pepper's Ghost. The term "*lantern*" should not deceive contemporary readers into notions of flickering, antediluvian lamplight; by the mid-1800s, these devices had abandoned their original candlepower, which indeed had produced only very dim images over short distances. The invention of limelight in 1820[36] allowed the magic lantern to really work its magic by shining bright, powerful light and allowing for the projection of clear visuals at a greater distance, resulting in much bigger images able to be viewed by larger groups of spectators. Nor were these displays merely early versions of today's static PowerPoint slides;

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[33] Photocopy of newspaper page, "Royal Polytechnic Institution," *The Times (London)*, Nov. 16, 1857, 'Photocopies of news articles from The Times,' 7-21-8, Royal Polytechnic Institution archives, University of Westminster, London.

[34] Newspaper clipping, "Polytechnic Institution," unknown source, 1846, 'Press cuttings,' 4-1, Royal Polytechnic Institution archives, University of Westminster, London.

[35] John Henry Pepper, *The Boy's Playbook of Science* (Glasgow, Manchester, and New York: George Routledge & Sons, 1881), 349.

[36] Limelight is a form of intensely bright light produced by burning quicklime (calcium oxide) with a flame of lit oxyhydrogen gas. Its common usage on 19th-century stages (beginning around the time the Polytechnic opened) is the origin of the phrase "in the limelight."

with as many as six magic lanterns simultaneously projecting onto a single screen, the Polytechnic's projectionists innovated several ingenious methods of animation and visual effects that contributed to the prehistory of cinema.[37] Under the direction of Henry Childe in the first years of the Polytechnic, these displays were employed strictly to add visualizations to scientific lectures, though later they were used for more narrative and dramatic visualizations. That tug-of-war between entertaining spectacle and rational instruction is always present in descriptions of the lantern's service at the Polytechnic. Lecturer T.C. Hepworth, in his practical guide *The Book of the Lantern*, mentions the popularity at the Poly for "this form of amusement" before insisting, "There are few branches of science in which the optical lantern cannot be made useful for purposes of demonstration."[38] Pepper, likewise, acknowledged that while lantern visuals were highly effective "means by which lectures on astronomy can be elucidated," the dazzling imagery — by a device he repeatedly refers to as "the Phantasmagorical Lantern" — also could add to the "hilarity of a party of merry younkers in a long winter's night."[39]

Pepper's use of the magic lantern to visualize science at the Polytechnic operated to conjoin two goals of popular science. For a hundred years by then, European natural philosophers (who had only just recently been rechristened with the new label "scientists"[40]) had been using various visual instruments to show things that were normally beyond the sight of the naked eye. Telescopes were showing the stars and planets. Microscopes were showing bacteria

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[37] Pepper wrote in detail about some of the magic-lantern effects deployed at the Polytechnic, especially the dissolve of imagery into and out of the frame through the use of toothed shutters and the dialing of one illuminating gas jet down while a second comes up. This was often done with three lanterns in play: two of them handling the main views while the third adds "what are known as 'effects.'" But again, these were highly multimedia/multisensory experiences, as in addition to the visuals were "a host of accessory apparatus behind the screen for the production of noise — thunder, wind, cannon shots, the roars of hungry beasts, &c., &c." (Pepper, *The Boy's Playbook of Science*, 350).

[38] T.C. Hepworth, *The Book of the Lantern* (London: Wyman & Sons, 1888), viii.

[39] Rev. J.G. Wood, John Henry Pepper, and et al., *The Boy's Own Treasury of Sports and Pastimes* (London & New York: George Routledge & Sons, 1868), 569.

[40] Ross, .

and cells. This was a chief function of the scientific act: making invisible things visible. These tools, however, usually showed their imagery to single viewers. "Unlike the microscope, telescope, and other contrivances which can only be used by one person at a time," Pepper writes, "the lantern can be made the medium of amusement or instruction for large audiences."[41] The projection of technical imagery helped put the "popular" in popular science by making the visuals large — not just to increase the resolution and examination of the imagery, but to make the viewing of it a social experience. The viewing subject of this imagery thus is hailed not only as a student of the world's mysteries but also now as a member of an audience sharing an experience and part of the same discursive practice. In addition, the Polytechnic designed itself to accommodate this kind of subject. Polytechnic lectures and demonstrations were not carried out in dull classrooms or lecture halls. The original Polytechnic included a small upstairs theater (with a cramped musician's pit that aided in the premiere of Pepper's Ghost in 1862), and by 1848 a 1,500-seat theater had been added on the south side of the hall, featuring tiered seating, a full stage, a 425-square-foot projection screen, and a large projection booth (arguably the world's first). This was not a didactic science delivered to individual learners but a popular science projected to audiences within staged spaces. When these same theaters began producing Pepper's ghosts, the sociability of the experience contributed greatly to its uncanny disorientation by projecting a previously intimate, domestic encounter into a public space.

The Polytechnic theater was not unlike a surgical theater. Both had been made newly possible in the mid-1800s by the aforementioned invention of limelight, which provided illumination bright enough for viewing from greater distances, such as from the gallery of the

[41] Pepper, *The Boy's Playbook of Science*, 346.

operating room at the original St. Thomas' Hospital across the Thames[42] or from the 11th row of the Polytechnic's large theater. Just five years before the Polytechnic opened, Jeremy Bentham's dying wish — to be dissected by medical students in a surgical theater before an invitation-only audience — illustrated a similarly dramatic potential of scientific instruction. Bentham's intention was to utilize the performative medical space to change minds about a specific superstition about the posthumous body.[43] Pepper similarly sought to shine his limelight on irrational beliefs within his audience, spotlighting them through the illumination of selected objects. Annemarie Mol's study of medical imaging situates such visualizations as targeting mechanisms for categorization of the deviant; the offending object or discourse is "revealed so that it can be stripped away." But her extension of this idea highlights the Polytechnic's practices: "*Enacting* disease takes the form *of counteracting* it."[44] To enact implies a performative materialization, the staging of an idea, the handling of an abstraction in order to knead and mold it. Pepper's go-to strategy was the projection of a visual spectacle that would assist him in the enactment of the very behavioral response he sought to change with his explanatory follow-up. One of his most popular lectures using the magic lantern featured an attached microscope, under which he would place a drop of London tap water and project the

[42] "History of Old St Thomas' Hospital," https://oldoperatingtheatre.com/resources/history-of-old-st-thomas-hospital/

[43] Bentham's intention with this request was, true to form, entirely utilitarian. While today the dissection of bodies is a common practice for medical training, in the early 19th century it was a significant taboo and considered "a fate worse than death" (Ruth Richardson and Brian Hurwitz, "Jeremy Bentham's Self Image: An Exemplary Bequest for Dissection," *British Medical Journal* 295 (1987): 195). Seeking to change public attitudes — much like Polytechnic lecturers were seeking to remove a superstitious hurdle out of the way of modern progress — Bentham not only requested his own posthumous examination but left careful instructions for it to be, as has been noted, "no ordinary dismemberment but a secular resurrection" (ibid., 197). The event lasted two days. The entire first day featured Bentham's close friend and physician, Southwood Smith, reading a 20-page speech over the body — an intriguing text in which Smith rhapsodized about Bentham's ability, through this very action, to continue enacting an embodied agency after death (as explored further in my Conclusion).

[44] Annemarie Mol, *The Body Multiple: Ontology in Medical Practice*, ed. Barbara Herrnstein Smith and E. Roy Weintraub, Science and Cultural Theory (Durham and London: Duke University Press, 2002), 90, 93.

imagery onto the theater's large screen.[45] The audience was horrified by the sight of creepy-crawlies moving around in the water they drank. But Pepper's lecture did not call for the filtration of microbes from local taps. His arguments were conceptual rather than practical. Instead, the Londoners grimacing at his screen were called upon to think differently by seeing differently. They were encouraged not to look at what they saw but to visualize something else.

Pepper also recognized that the magic lantern itself should not become the spectator's focus of fascination or the site of interaction. The material technology was not on display; its projected technical imagery was. This was a crucial early step in the emergence of technical imagery — the separation of the image from the site of its physical production. Once seemingly loosed from its material constraints, though, the technical image was called upon to continue working on behalf of the museum's ideological mission. The Polytechnic's frequent misunderstandings of the different uses and functions of technical imagery, as compared to traditional imagery, resulted in the institute's ongoing and defining struggle: attempting to lash spectacular technical imagery to the service of its social engineering. In the context of a scientific lecture, imagery from a magic lantern "should be … subservient to the text," Hepworth writes[46] (presaging Flusser's claims about writing's prescriptive function: "The purpose of Alphabetic texts was to explicate images"[47] which occurred when writing "transcoded the circular time of magic into the linear time of history"[48]). Pepper's published chapters about the history of magic lanterns recognize its innate function of creating "startling appearances," but those appearances were meant to remain dutiful to the Poly's instructive programming — to be, per the press reviews, "diversions in sport" while ultimately "they illustrate the wonders and secrets of

[45] Pepper, *The Boy's Playbook of Science*, 307.
[46] Hepworth, 266.
[47] Vilém Flusser, *Into Immaterial Culture* (Metaflux, 2015), 17.
[48] Vilém Flusser, *Towards a Philosophy of Photography* (Göttingen, West Germany: European Photography, 1984), 7.

'science' in earnest,"[49] and so that the lecture remains one of the "scientific kind" while "it almost approaches the character of an 'entertainment.'"[50] The *almost* was the hard part, and the Polytechnic often failed to keep its dazzling technical imagery in strict service of its discursive programming. Frequently, the programming of the institution was overwritten by the "coding" of the technical-imagery system itself, and the Polytechnic ultimately failed in its efforts to transform Britons completely into media-savvy moderns.

A new magic: Transforming the scientific lecture into spiritualist séance

The namesake of Pepper's Ghost, as it came to be developed, was not the illusion's sole inventor. In 1862, a patent agent and hobbyist named Henry Dircks brought a model of his idea for a performative illusion to the Polytechnic for evaluation and possible development. Dircks had devised a way to scale up the illusion for use on the stage, so that an offstage actor could be illuminated and — via a specific arrangement of mirrors and glass — appear on a stage or, more importantly, appear to disappear from it. The Polytechnic offered assistance to such inventors in developing their ideas and obtaining patents for them. After shopping his design around elsewhere,[51] Dircks hoped for at least that much; he had not targeted the institute as a place

[49] Newspaper clipping, "Royal Polytechnic Institution," unknown source, May 11, 1859, 'Press cuttings,' 4-1, Royal Polytechnic Institution archives, University of Westminster, London.

[50] Photocopy of newspaper page, "Royal Polytechnic Institution," *The Times (London)*, Nov. 16, 1857, 'Photocopies of news articles from The Times,' 7-21-8, Royal Polytechnic Institution archives, University of Westminster, London.

[51] Between 1838 and 1858, Dircks tinkered with the illusion, eventually branding his own design as the Dircksian Phantasmagoria. He presented his idea for the illusion at meeting of British Association for the Advancement of Science in Leeds on Sept. 16, 1858 (Steinmeyer, *The Science Behind the Ghost!*, 17; Steinmeyer adds that Brewster was present here and examined the model), where he claims he did so "in a purely scientific and not in a popular point of view" (Henry Dircks, *The Ghost!: As Produced in the Spectre Drama, Popularly Illustrating the Marvellous Optical Illusions Obtained by the Apparatus Called the Dircksian Phantasmagoria: Being a Full Account of Its History, Construction, and Various Adaptations.* (London: E. and FN Spon., 1863), 21). His paper describing his use of the "transparent mirror" (quoted in Steinmeyer, *The Science Behind the Ghost!*, 13) in an "apparatus for producing Spectral Optical Illusions" (Dircks, 4) was summarized in various journals and attracted

where his idea might be realized. The Polytechnic, as explicated above, was a museum driven by a rigorous Enlightenment ideology, not a magic parlor (or so its operators believed). But Pepper and his scientific colleagues saw in Dircks' ambitious apparatus a potentially poignant use for their own purposes — one that might slot into the institute's particularly zealous programming.

In his scaling of the illusion, Dircks recognized the same potential that Pepper had recognized in the magic lantern: the ability of the visual apparatus to widen a viewing experience from individuals to social groups. Pepper had operationalized the lantern as a viewing aid during scientific lectures; Dircks had more entertaining uses in mind, but they both sought to turn viewing experiences for individuals into a larger, social experience. Dircks specifically contrasts his design with the illusion's use within Porta's chamber and Séguin's toy[52]: "My invention is *not* one for raising a spectral appearance at a distance, or shut up in a chamber, as a mere phantom to be gazed at in its solitary cell"; instead, Dircks writes, the purpose of what he christened the Dircksian Phantasmagoria is so that "specters could be set on a stage for public gaze."[53] British theater audiences by this time were accustomed to seeing ghosts depicted on stages, but any otherworldly identity of those figures was signified by gloomy makeup, spectral robes, or apparatuses designed to simulate an actor's spectral materialization on stage.[54] Dircks saw the novel theatrical potential in his scaling of the illusion and its renegotiation of visual signifiers of spectrality. The move constituted for Dircks nothing less than "the absolute

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little initial interest (Steinmeyer, *Hiding the Elephant: How Magicians Invented the Impossible and Learned to Disappear*, 25).

[52] See footnote #3.

[53] Dircks, 37, original emphasis.

[54] Pepper's Ghost in one sense was a technical update for the theater that bested the existing standard for stage spirits. Nearly a decade before Pepper's illusion, the premiere of "The Corsican Brothers" by Dion Boucicault had instituted a device specially for the manifestation of a ghost; known still as the "Corsican trap," its hidden ramp and trolly made an actor appear to rise through the stage floor. The appearance stunned and shocked audiences and contributed to enormous success for an otherwise unremarkable play (see Geraint D'Arcy, "The Corsican Trap: Its Mechanism and Reception," *Theatre Notebook: A Journal of the History and Technique of the British Theatre* 65, no. 1 (2011)).

realization of all that ever had been dreamt, or ever had occupied frenzied fancies, or formed the staple conceits of dramatists and romancers."[55] Hyperbole aside, popular science also was drawing upon many of those same dramatic fancies, and Pepper and the Polytechnic saw in Dircks' plan a new way to fortify their public visualization of science.

Pepper quickly recognized several things about Dircks' invention — its problems and its potential. The ambitious scale of Dircks' design was both its blessing and its curse. The Dircksian Phantasmagoria was not a rig for an existing stage but a purpose-built theater, specially constructed from the ground up for the presentation of this specific illusion — the IMAX theater of its day.[56] A theatrical organization in London likely would not have the resources to construct an entire building based on a single illusory effect, no matter how marvelous, and while science was indeed popular at the Polytechnic, the institute's coffers could not have funded new construction to such an extent. Pepper would have seen this immediately but just as quickly recognized two other aspects important to the development and eventual popular success of the attraction as entertaining instruction. First, he saw that, scaled up to this degree, this illusion could present the image of a full human body as if it were in a space it actually was not. By coordinating the onstage action and the illumination of the apparatus, that body image could appear and disappear, could interact with actual bodies in a seemingly spectral fashion, and could — drawing on considerable sociocultural instincts — represent "real," "live" ghosts. The purely theatrical potential of the system would be considerable (and profitable, once patented), and Pepper's eventual design of the illusion along these lines eventually was used

[55] Dircks, 23.

[56] In Dircks' plans, an audience is seated not on the ground but in a raised gallery angled down toward the stage. Underneath the audience is a second stage, unseen by the spectators and painted or draped in black. Between the audience and the main stage is a large, vertical pane of glass. Unseen actors on the second stage, when illuminated, are reflected in the glass, thus appearing amid the actors on the main stage in proportion to their distance from the glass. (Thus, the second-stage actors do not appear to the audience to be reflected *on* the glass but *behind* it.) Special, shuttered windows were to be placed alongside each stage for illumination of the actors.

throughout stage dramas in Britain, France, and the United States.[57] Secondly, Pepper's particular insight in adapting Dircks' design was to angle the glass on which the illusion is manifested, thus allowing its production in existing theaters by situating the glass on a stage and hiding the confederate actors in orchestra pits, rather than the bespoke second stage underneath the audience in Dircks' design.

But while Pepper might have seen some money from a patent on the apparatus,[58] its specific spectacle was harnessed as an instructive means rather than an entertaining end. Specifically, Pepper's Ghost was recruited to participate in the Polytechnic's ongoing social re-education campaign to counter and debunk spiritualism. Just as the institute was hitting its stride as a shrine of science during the 1850s and 1860s, the popularity of spiritualism also peaked throughout Britain, the United States, and northern Europe. This social movement promoted not only the belief that the dead lived on in spirit form but that those spirits could be contacted and communed with (or *communicated* with, per John Durham Peters' study of the spiritualist roots of the very concept of modern communication, from mediums to media[59]). Much of the Polytechnic's public posture presented its programming precisely as an antithesis to what it

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[57] See Sofie Lachapelle, *Conjuring Science: A History of Scientific Entertainment and Stage Magic in Modern France* (New York: Palgrave Macmillan, 2015).

[58] Pepper outlined his update of Dircks' design and patented the apparatus in both names as filed on Feb. 5, 1863. The original patent describes the illusion: "The object of our said Invention is by a peculiar arrangement of apparatus to associate on the same stage a phantom or phantoms with a living actor or actors, so that the two may act in concert, but which is only an optical illusion as respects the one or more phantoms so introduced" (photocopy of patent application, "Application for Exhibiting Dramatic and Other Performances," No. 326, Feb. 5, 1863, 'Photocopies of Patents leased by John Henry Pepper,' 7-23, Royal Polytechnic Institution archives, University of Westminster, London). Shortly thereafter, the patent was a brief but regular feature in news reporting. A report of the illusion at the Polytechnic in The Art Journal a few weeks later says that "the discoverers have announced one fact, amusingly characteristic of our practical age, which is that they have 'patented their ghost'" (photocopy of newspaper page, "The Polytechnic Institution," *The Art-Journal*, unknown date, 1863, p.103, 'Photocopies of news items from The Art Journal,' 7-21-4, Royal Polytechnic Institution archives, University of Westminster, London.), and by June the Polytechnic's own classified ads were warning would-be copycats that "INFRINGING the PATENT" would be dealt with severely, but then, "Licenses can be obtained on reasonable terms" (Classified ad, "Professor Pepper's Ghost," *The Times (London)*, June 3, 1863, p.1, Times Digital Archive, 1785-2012).

[59] John Durham Peters, *Speaking into the Air: A History of the Idea of Communication* (Chicago: Univ. of Chicago, 1999).

labeled this superstitious, irrational belief. The contrast may be viewed as a battle between epistemes or identities — the rational, scientific men of the Polytechnic trying to corral the allegedly irrational, superstitious ideas of spiritual mediums (who were largely women)[60] — though, in fact, both perspectives were ignited by the same social discourse. Spiritualism promoted itself as a kind of science in order to bestow science's emerging credibility on its practices and also to frame its supernatural magic as natural science. Séances were often called "proofs," with mediums inviting experts, scientists, and the general public to examine their performance spaces and their bodies for signs of chicanery prior to a conjuring. Spirit manifestations usually were produced via a different shade of technology, from tables and chests to the spiritualist's most significant technical medium, the spirit cabinet — a piece of furniture that would be opened to reveal some form of visual manifestation (e.g., costumed actors masquerading as the dead, the deposit of ectoplasm, materialized keepsakes), essentially a precursor to the television cabinet.[61] During the mid-1800s, with a remarkable correlation between their popularity and social influence, both scientists *and* spiritualists were advocating new technical means for the revelation of worldly *and* otherworldly wonders.

Polytechnic demonstrations of scientific principles were themselves, both literally and figuratively, séances. Its lecturers were often indistinguishable from spiritualists. This is a theoretical claim, of course, but the Polytechnic actually played up the comparison for public attraction. For instance, a frequently repeated event at the institute was billed with openly

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[60] Spiritualist mediums in the 19th and into the early 20th century largely were women, who found considerable freedom through the practice to both earn a living and behave in ways that challenged social norms. See Ann Braude's superlative study *Radical Spirits: Spiritualism and Women's Rights in Nineteenth-Century America*, 2nd ed. (Bloomington: Indiana Univ. Press, 1989) as well as Ludmilla J. Jordanova, *Sexual Visions: Images of Gender in Science and Medicine between the Eighteenth and Twentieth Centuries* (Madison: Univ. of Wisconsin Press, 1993).

[61] See Simone Natale, *Supernatural Entertainments: Victorian Spiritualism and the Rise of Modern Media Culture* (University Park, Penn.: Pennsylvania State Univ. Press, 2016). Valuable media archaeology of spiritualist technologies also continues on Brandon Hodge's website The Mysterious Planchette (myteriousplanchette.com) and his forthcoming book *Talking Tables & Scribbling Spirits: A Complete History of Spirit Communication Tools*.

spiritualist terms as "The Polytechnic Séance," which advertised "Table-Rapping, Table-Floating, Ghost Lights, Materializing and Dematerializing, Phantom Hand and Bottle Imp," conducted by a person called "the Polytechnic Medium" (whichever lecturer was drafted into the role that week)[62] and while Pepper himself "denounced the utter absurdity of table-turning and spirit-rapping" he often found himself delivering exactly those spectacles, despite intending markedly different epistemic outcomes. In an 1868 demonstration, he levitated a spirit medium seated in a chair, as well as the table before her and other pieces of furniture on the stage. In this instance, he let his actions speak for themselves. "Professor Pepper did not, of course, explain how this feat was performed," reported The Illustrated London News, "but he asserted that by a few simple mechanical contrivances the same thing could be done" by anyone.[63] Simply by recreating spiritualist manifestations within the context of the strictly scientific Polytechnic, the (tongue-in-cheek or even condescending) message was made clear to Polytechnic audiences that what may seem a supernatural wonder is easily controlled and reproduced by modern science. Spectators of these demonstrations were shown the same visual spectacles and presented with a new epistemic lens through which to see them and produce the Polytechnic's sanctioned meanings about them. As one London journalist wrote, in a praiseworthy critique of one of Pepper's lectures debunking spiritualism, "There is but one way of beating charlatans, and that is with their own weapons."[64]

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[62] "The Polytechnic Séance" advertisement, Polytechnic program, week of June 19, 1876, bound volume of Royal Polytechnic Institution programmes, no. 182, 3-16, Royal Polytechnic Institution archives, University of Westminster, London. A bottle imp was a kind of wish-granting genie.

[63] Photocopy of newspaper page, "The Polytechnic Institution," *The Times (London)*, April 14, 1868, 'Photocopies of news articles from The Times,' 7-21-8, Royal Polytechnic Institution archives, University of Westminster, London.

[64] Photocopy of newspaper page, "The Polytechnic Museum," *The Times (London)*, Dec. 23, 1867, 'Photocopies of news articles from The Times,' 7-21-8, Royal Polytechnic Institution archives, University of Westminster, London.

Even when the demonstration was not an overt challenge to spiritualism, Polytechnic lectures consistently called upon spectators to view invisible phenomena manifested before their eyes by an alternate classification of visualization apparatuses. The chief difference between Professor Pepper and a spiritualist medium lay in the moment he scheduled the opportunity for spectators to view the spatial and technical contexts of their respective visualizations. Spiritualists invited examination before producing the manifestations; Polytechnic scientists produced the manifestations before inviting examination. Thus, viewing subjects of spiritualist practices began their experience with a sense of enlightenment and ended it with bewilderment, while Polytechnic subjects were meant to enter bewildered and leave enlightened. This order of experience was the definite and consistent m.o. of *popular* scientists; startle, *then* explain. Magic, *then* science — though the very existence of *any* explanation was meant by both to contrast their performances with stage magic, as it was developing from an itinerant to a professional practice around the same time in the 19th century. (Ellis Stanyon, a stage magician in the late 19th century, was firm in his published advice to aspiring magicians: "Never tell the audience what you are going to do before you do it."[65] That is, explaining the magic spoils the magic. But he was specific on the timing: explaining *beforehand* spoils the thrill; he says nothing of afterward.) Even as Pepper himself borrowed liberally from stage magic and showmanship in the presentation of his lectures, he and the other scientists at the Poly slept comfortably with their credentials by adhering to their strict practice of the *explained* spectacle, the narrative addendum of positivist truth attached to any dazzling display. The lecturers' usual move was to explain each and every trick — briefing the audience on "Spirit rules and regulations"[66] — and reveal any

[65] Ellis Stanyon, *Magic: In Which Are Given Clear and Concise Explanations of All Well-Known Illusions, as Well as Many New Ones*, e-book ed. (Philadelphia: Penn, 1910).
[66] "Spiritism" advertisement, Polytechnic program, week of June 25, 1877, bound volume of Royal Polytechnic Institution programmes, no. 232, 3-17, Royal Polytechnic Institution archives, University of Westminster, London.

technical devices or particular spatial arrangements that produced the legerdemain. That was Pepper's consistent m.o. as a popular-science lecturer: wow you with giant electric sparks, followed by a rational explanation; wow you with projections of creatures in your tap water, followed by a sober explanation; wow you with minor chemical explosions, followed by a calm explanation. Entertainers and stage magicians dazzle and depart, but the Poly's presenters believed themselves to be scientists precisely *because* they followed spectacular phenomena with rational explanations. The press consistently report that Polytechnic demonstrations "are not left unexplained"[67] and are widely accessible ("scientific yet simple — so that a child might understand them"68 or even "the dullest intellect cannot fail to comprehend"[69]).

Audiences were meant then to transmit that knowledge outside of the Polytechnic, carrying their instilled modern skepticism into London streets, where it might inoculate against spiritualism's spread. Polytechnic lecturer James Wylde expressed hope that after the experience of a Polytechnic lecture or two, "when you next attend the performance of a 'Wizard,' you may be able to explain many of the deceptions of the sense which they practice."[70] The viewing subject at the Polytechnic would emerge able to differentiate between, as one lecture program labeled the binary, "Lying Spirits" and "The modern materialized spirit."[71] The difference in terminology, however, is key to the Polytechnic's participation in the emergence of technical imagery: old bogey *non*-technical spirits tell lies, while technically materialized ghosts tell modern truths. It's not that the existence of a ghost necessarily signifies a deception; the truth

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[67] Newspaper clipping, "The Royal Polytechnic Institution," unknown source, May 30, 1874, 'Press cuttings,' 4-1, Royal Polytechnic Institution archives, University of Westminster, London.
[68] Newspaper clipping, "Polytechnic Institution," unknown source, 1846, 'Press cuttings,' 4-1, Royal Polytechnic Institution archives, University of Westminster, London.
[69] Newspaper clipping, "Polytechnic Institution," unknown source, undated, 'Press cuttings,' 4-1, p.76, Royal Polytechnic Institution archives, University of Westminster, London.
[70] Wylde, 326.
[71] "Spiritism" advertisement, Polytechnic program.

claim sits at the heart of which episteme's discourses and practices conjured that ghost. "The quest of many self-conscious 'moderns,'" says historian Shane McCorristine, "was, in essence, to prove that the supernatural was *not* supernatural, but rather 'preternatural,' a realm of undiscovered principles."[72] Science did not combat the magic that previously may have explained phenomena; it sought to correct it, to redirect and reframe its inquiries.[73] Viewing subjects at the Polytechnic likewise were instructed to side with the correct ghost produced by the sanctioned ghost-conjuring system: not *supernatural* magic, but *natural* magic.

With one hand, Polytechnic scientists sought to erase what they saw as outdated, outmoded concepts of magical experience that offered irrational explanations. With the other, they seized magic and recoded it, magically transforming it into their own modern brand of experience and knowledge production. Just as spiritualist terminology was co-opted for their own countermeasures, Polytechnic events were routinely publicized as exhibitions of *a kind of* magic — and an overtly visual and illustrative experience — from James Matthews' series of "Magical Illustrations" (another optical illusion in which a magic-lantern projection of a talking

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[72] Shane McCorristine, ed. *Spiritualism, Mesmerism, and the Occult: 1800-1920*, vol. 1 (London & Brookfield, Vt.: Pickering & Chatto, 2012), x, original emphasis.

[73] This aligns with numerous book-length histories and explications of magic during this era that begin describing magic almost affectionately, claiming premodern practices once derided as magic and mystical as merely early, fledgling, ignorant steps along a linear trajectory toward Enlightenment. This thinking began on the European continent before making its way to England. In Germany, Joseph Ennemoser's 1854 *The History of Magic* insists that magic phenomena "must follow a general law" and that there "can be no miracles"; indeed, magic from the ancients was looked upon as "a higher knowledge of Nature" (*The History of Magic*, trans. William Howitt, vol. 1 (London: Henry G. Bohn, 1854), xiv, 1). Most influential was Éliphas Levi's history of the same title a few years later, describing magic as "the exact and absolute science of Nature and her laws," even "a single science … as exact as mathematics" (*The History of Magic*, trans. Arthur Edward Waite (New York: Cambridge Univ. Press, 1860/2001), 1, 2). A century later, traces of this perspective remained: British archaeologist Ralph Merrifield, in his 1987 material study of magic, separates magic from religion on this basis: "'religion' is used to indicate the belief in supernatural or spiritual beings; 'magic,' the use of practices intended to bring occult forces under control and so to influence events" (*The Archaeology of Ritual and Magic* (London: Guild, 1987), 6). This is a key distinction in the wake of the era's massive and swift industrialization: science may have emerged making claims that it sought only to reveal and describe nature, but its practices easily partnered with 19th-century capitalists who sought to control and exploit nature. Nonetheless, this early discourse of magic as a historic precedent to Enlightenment science squarely confounds the disenchantment thesis of modernity and instead infuses the practice itself into rationality's own process of indoctrination.

lion was billed as a "Very Amusing and Instructive Entertainment," the latter adjective because the illusion was explained) to Edward V. Gardner's popular lectures on "Chemical Magic," (which began with discussion of the magi and premodern magic, then "contrasted" those with "Modern Magians", closing with "Experimental Illustrations"). Programs hawked "some illustrations in NATURAL MAGIC,"[74] and ads trumpeted "Prof. Logrenia's Magical Wonders and Mysterious Transformations."[75] Lecturer James Wylde's book quoted above was titled *The Magic of Science* and published in 1861, the year before Pepper's Ghost debut. It concludes with a chapter titled "Natural Magic," in which he instructs on how to use technical science to amuse and amaze. It's a book of spells, and it defines its magic thusly:

> By the word 'magic' we generally understand something which is strange and unexpected — something, in fact, which strikes our imagination rather than our reason; and yet after all, what is more magical or wonderful than those changes which science brings before us?[76]

Real-izing the virtual and embodying the image

As a lecturer who consistently and unapologetically conflated magic with science — who referred to his position at the Polytechnic podium as being inside "the magician's circle,"[77] who described experiments as if they were tricks (introducing reagents by saying, "But, lo! the magician's wand!"[78]) — Pepper was primed to see within Dircks' model a dramatic and possibly unique potential for furthering the ideological goals of the Polytechnic. Not only would the production of a supernatural specter and the subsequent reveal of its natural workings strike

[74] Advertisement, Polytechnic program, week of June 9, 1873, bound volume of Royal Polytechnic Institution programmes, no. 21, 3-9, p. 8, Royal Polytechnic Institution archives, University of Westminster, London.
[75] Newspaper clipping, "Royal Polytechnic Institution," unknown source, undated, 'Press cuttings,' 4-1, p.74, Royal Polytechnic Institution archives, University of Westminster, London.
[76] Wylde, 325-326.
[77] Pepper, *The Boy's Playbook of Science*, 316.
[78] John Henry Pepper, *Popular Lectures for Young People* (London: Sampson Low & Son, 1855), p. 4 of "Half-Hours With the Alchemists, Part I," 4-2, Royal Polytechnic Institution archives, University of Westminster, London.

blows against spiritualist discourse, the ghost illusion offered Pepper a significant enhancement of his use of visuals to explain and promote his science. Rather than imagery projected *alongside* Pepper's lectures and demonstration, as magic lantern slides and microscope projections had been, the ghost illusion would enact its own explanation. Rather than text and imagery existing beside each other, the ghost illusion infused them into each other, spectralizing them into a liminal entity between the material and immaterial, and constituting one of the first of Flusser's dialectics between image and text.

The premiere of Pepper's Ghost afforded its namesake tight control over its production and the potential reception of its spectators. As a possible indication of how special and spectacular Pepper recognized the ghost illusion could be, he scheduled its premiere on one of the Polytechnic's grand holiday programs: Christmas Eve, 1862, for a private guest list of journalists, fellow scientists, and more than a smattering of London's well-to-do. The illusion was debuted in the Polytechnic's smaller, upstairs theater, which afforded Pepper strict command over his new experiment and, especially, over the positioning of his viewing subjects. Amid his praise for pre-modern magicians and the tactics he borrowed from them, Pepper notes that in order for most illusions to succeed "the spectators must be rigidly confined," ideally in "a well-darkened room," in which the magician "diverted the thoughts of the more curious, and prevented them watching the proceedings too closely."[79] Such a fixed, controlled spectator position may seem to belie the untethered, mobile holosubject explored in subsequent chapters of this dissertation; however, the emerging holosubject within the Polytechnic is not yet in its audience — it's on its stage. Viewers of the Pepper's Ghost illusion are watching a Polytechnic *demonstration*, this time of an interaction between a *depicted* holosubject and a spectral,

[79] Pepper, *The Boy's Playbook of Science*, 316.

technical image. Pepper's use of the illusion is pedagogical. He intends to reveal spiritualist fraud, but he's also performing the metaphor of modern media then still assuming form through the development and display of technical imagery at the Polytechnic and elsewhere. Spectators in this audience are seeing what kind of subject they *could become* by transferring their relationship from one epistemic frame to another, and as enacted through interaction with modern media technologies.

As Pepper's audience watched his demonstration of a human interaction with a spectral entity about to be revealed as an embodied image projection, they did so even as the production itself disembodied the onstage actors in a way that will become endemic to modern electronic media in the decades to follow. Even Pepper's adaptation of the illusion to an existing theater had not solved a particular challenge when using it to projection imagery of human bodies: the angled glass hung between actors and audience, creating a sound barrier. Thus, this and nearly all presentations of Pepper's Ghost as he designed it used pantomime. Such narrated drama was not unusual to London audiences in the mid-1800s, though the dislocation of a bodily function (in this case, transferring the actor's speech to a narrator) within the context of a technical assemblage would prefigure phonographs and microphones — electronic media experiences that call on an increased imaginative capacity in their subjects, as well as the cognitive calculation to assign the voice they *hear* to the other body they *see*. Pepper's pantomime is not electronically amplified, but it nonetheless contributes to the formation of what Paul Sanden calls a "sounding cyborg" and hails spectators who, "seeking their own subject positions, may also assign subjectivity to that with which they seek communication. … In other words, they construct a virtual performing 'You' — a performing persona — in order to complete the line of

communication.[80] Allan Sekula's perspective on the emergence of photography, discussed in my Introduction, frames its viewing experience as one that recasts its subject "as a 'thing apart,' and as an *abstraction*,"[81] essentially spectralizing not only the antecedent of the image but (in order to meet it on the medium's terms) also the spectator of it. Polytechnic audiences are not yet subjects participating in this experience of holopresence, but they are watching a depiction of a subject they will soon learn is interacting with an image he cannot see, a body that is not present before him. Pepper's Ghost begins fusing the spectrality well-known to believers of ghosts in Victorian London to the concept of virtuality as a technically mediated experience, demonstrating to its viewing subjects how to begin constructing that virtual persona that is the spectral entity projected by modern media. Once revealed as a natural, technically mediated encounter, the Polytechnic subject learns to assign liminality to the experience of modern media systems also projecting the incomplete figure of an absent person for their interaction. When the Pepper's Ghost assemblage returns to stages in the 21st century, as examined in Chapter 4, we will see the cultural reach of this normalization of the spectral, mediated encounter.

[80] Paul Sanden, "Virtual Liveness and Sounding Cyborgs: John Oswald's 'Vane'," *Popular Music* 31, no. 01 (2012): 49.
[81] Allan Sekula, "Photography between Labour and Capital," in *Mining Photographs and Other Pictures, 1948-1968*, ed. Benjamin H.D. Buchloh and Robert Wilkie (Halifax: The Press of the Nova Scotia College of Art and Design, 1983), 247.

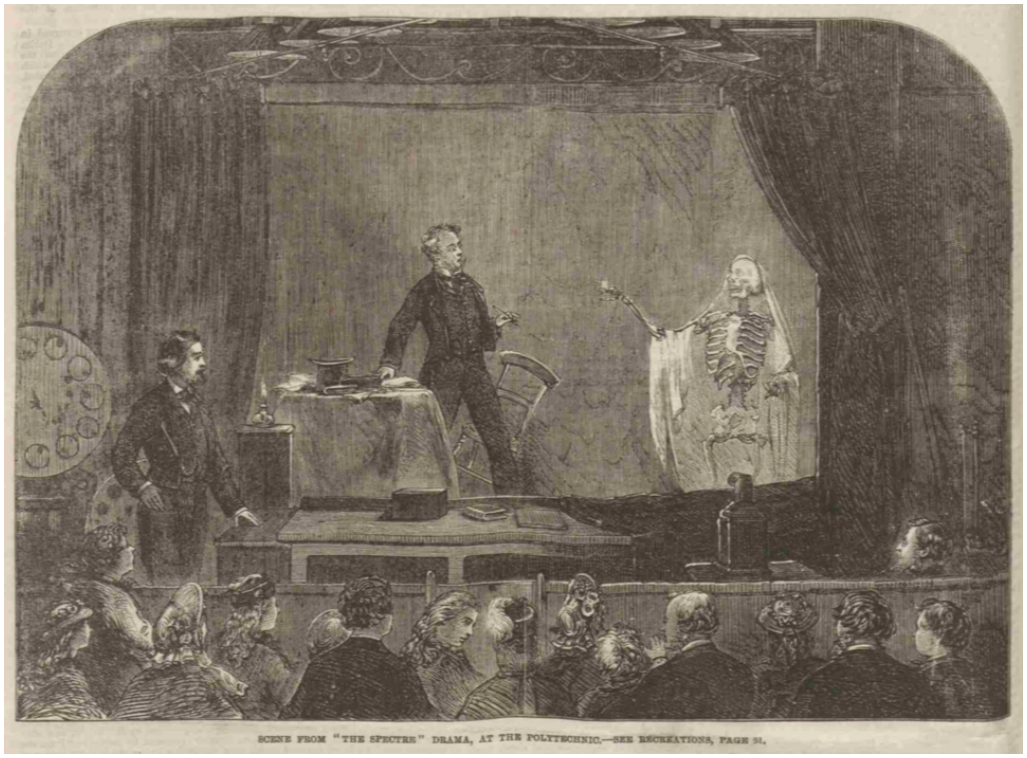

Figure 1.2. This newspaper illustration[82] shows the premiere of Pepper's Ghost on the small Polytechnic stage. Professor Pepper (left) stands aside the stage narrating the action, while the onstage actor (center) pretends to react to the sight of the skeleton (right), which is the reflected imagery of an offstage actor.

For the premiere, and for many Polytechnic productions in the years to follow, the person narrating the pantomime was Pepper himself. Given the staging described above, Pepper's Ghost was carefully programmed on the Christmas Eve bill, the second of three events, following a pre-*Zitella* retelling of the Cinderella story (featuring some dissolving views projected by magic lanterns). The scheduled closer was a ventriloquist.[83] Pepper chose to debut the illusion in a scene from Charles Dickens' *The Haunted Man and the Ghost's Bargain* (1848), a tale of a chemistry professor (like Pepper) named Redlaw, who is confronted by a ghost offering to erase

[82] Scan of newspaper page, "Scene from 'The Spectre,'" *The Penny Illustrated Paper*, Feb. 7, 1863, p.84, The British Newspaper Archive.
[83] These acts could have been selected because their presentation in the space would not disturb the Pepper's Ghost arrangement, which required its heavy sheet of glass to be in place before the audience was seated.

Redlaw's unpleasant memories. The demonstration itself was titled "A Strange Lecture," a titular tweak of *A Strange Story*, Edward Bulwer-Lytton's novel of earlier that year (in which a rational, materialist protagonist debunks a colleague's spiritualist beliefs). Pepper set up only the scene in which the ghost appears. The actor portraying Redlaw is seated, bent over a desk piled with books and papers, facing stage-right. Behind him, a painted backdrop depicts his laboratory. Stage-left is dark — until a gradual illumination reveals a skeleton sitting behind Redlaw, gazing at him (see **Figure 1.2**). Thus far, the visuals have been conventional, and the carefully rehearsed illumination of the skeletal figure reflected in the glass is proportionally lit and sized so as to appear as a figure present on the same stage as Redlaw. "This ghost," Pepper explains, "was admirably performed by my assistant … who, wearing a cover of black velvet, held the real skeleton in his arms and made the fleshless bones assume the most elegant attitudes, the lower part from the pelvis downward being attired in white linen, and the white skeleton ghost assuming a sitting posture."[84] The seated posture is because this was the small theater, not the big one, and the pit, such as it was, was cramped. To an astute observer, the lighting on the skeleton might seem unusually bright; its shadows maybe don't correspond naturally to the illumination of Redlaw. Some in the small theater, depending on where they're sitting, might notice glints or glimmers when the skeleton appears on stage, but they likely can't determine why, either because of their immersion in the brief narrative or because the veiling of the visual apparatus (with drapes to both sides and above) is successful. Nonetheless, there is little to trouble the phenomenological sense-making of the experience: there before the audience are two actors on the same stage about to interact.

[84] Pepper, *The True History of the Ghost, and All About Metempsychosis*, 29.

The drama itself delivers the illusion's first, entertaining reveal. "Resenting the intrusion," Pepper recalled the narrative many years later, "[Redlaw] rises, seizes a sword or a hatchet which is ready to his hand, and aims a blow at the ghost."[85] But when Redlaw swings the sword at the skeleton, it passes right through. The skeleton is unmoved, untroubled. The lighting on the skeleton blinks out, effectively causing the figure to vanish. Gasps in the audience, a startled shriek. Redlaw seems just as astonished. If that was indeed a human actor occupying the space he seemed to be, he's just been cleaved. Pepper, standing casually at a desk to the left of the stage (as depicted in Fig. 2), continues narrating the scene, his calm indicating that perhaps a surgeon needn't be summoned, after all. Suddenly, there's the ghost again, newly illuminated and sitting in the same spot, its arms waving about slightly, apparently undamaged. Another swing of the weapon, and again it slices through the air where the material body seems to stand before vanishing once more. The audience murmurs and guffaws, unclear as to how a figure can be standing *right there* … and yet *not be there*. Apocryphal accounts of this premiere moment include claims of audience members fainting or fleeing the theater in supernatural terror, thinking they had seen a supernatural specter. This is the peak of the Polytechnic spectator's uncanny experience. As with Pepper's rebooted séance, the audience may recognize that they are within the confines of a strictly scientific institution; yet this clashes with not only the narrative about a ghost but the striking visual of a body that not only looks but acts spectral, a sight that likely activates non-scientific explanations of its being, origin, and intent.

That, however, was not the end of the drama or the illusion's social impact. Two further actions significantly built on the awe of the visual spectacle. First, the character of Redlaw completes his conversation with the ghost, who makes his wish-granting offer for Redlaw to

[85] Ibid.

consider. However brief this dialogue may have been, it is nonetheless an opportunity for Pepper's rapt viewing audience to watch a human converse with a present ghost — one that would, moments later, be revealed to be a different kind of spectral entity, a carefully controlled vision explained by Pepper's additional, scientific reveal. The night of the premiere, though, just after the skeleton had vanished, Pepper turned to his audience prepared to explain the sight; he was "greeted with silent stares, then an unexpected torrent of applause."[86] By his own account, the audience reaction was "startling in the extreme, and far beyond anything I could have hoped for and expected."[87] Such an affective response became a typical feature of the Polytechnic experience of the illusion, particularly in the earlier days of Pepper's Ghost, and Pepper counted on it — in order to counter it. After allowing the shock of the visual spectacle to die down, Pepper then would settle his scientific accounts, making sure the audience left with the Polytechnic's traditional, rational explanation of a seemingly supernatural spectacle. He redirected attention from the image itself to the apparatus delivering it — undoing its very function by specifically making visible the parts of the system that previously had been made invisible. Tapping the glass — again, unseating it from its veiled frame, the very key to the illusion's success — Pepper would reveal its presence to the audience. He would summon his draped assistant to stand up in the orchestra pit, revealing his presence. He would describe the limelight, the reflections, the physics of the glass. Pepper's instructional practice purposely withdrew his spectators from their immersion not just in the brief narrative but in the visual experience of the virtual.

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[86] Steinmeyer, *Hiding the Elephant: How Magicians Invented the Impossible and Learned to Disappear*, 30.

[87] Pepper, *The True History of the Ghost, and All About Metempsychosis*, 3. In the Polytechnic archive, I found only one mention of the Pepper's Ghost illusion actually failing and spoiling its illusion. A newspaper item from 1879 mentions a performance that "was cut short … owing to the very imperfect apparatus, and especially in consequence of a crack in the mirror or plate glass. The gallery, on detecting the poverty of the trick, greeted the performance with derision and laughter" (Newspaper clipping, "The Singing Angels' Heads," unknown source, 1879, 'Press cuttings,' 4-1, p.65, Royal Polytechnic Institution archives, University of Westminster, London.).

In the cinema that would dominate animation within a few decades, technical imagery was projected onto an opaque screen; the film spectator at least is able to see this screen — at some point before, during, or after the film — and thus recognize their subject positioning within a media system. While Bazin likens this negatively to Plato's restrictive, disempowering cave,[88] the fact that the movie screen is visible and yet goes unseen contributes to film's experience of narrative immersion and acceptance of the screen's projected virtual space. Barthes refers to this irony as the "cinema situation," in which the screen is visible but, due to film's particular phenomenological magic, remains "unperceived."[89] The Pepper's Ghost situation presages this immersion, not by opening a window for transport into the virtual but by suggesting that no window exists to open, that the virtual (once revealed to be so) is real. Pepper's Ghost tells a bolder Platonic lie: *There is no cave wall, no screen, thus what you see is not projected but present, not virtual reality but real virtuality*. By using his notion of scientific truth to counter this deception, Pepper delivers a second materialization meant to be just as shocking as the original ghostly image, bringing up the houselights in Plato's cave, as it were, so that the emotional response tugging a spectator toward supernatural explanations of the phenomenon might also nudge a Polytechnic subject toward the lecturer's proffered and preferred explanation of the illusion's natural origin. Once conjured, Pepper's ghosts had to vanish so that his science could appear.

As Flusser quips, however, "If one throws metaphysics out through the door, it comes back through the window."[90] A ghost, whether explained superstitiously or scientifically, remains a ghost. Pepper's rational explanations did not possess a complete enough power to

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[88] André Bazin, *What Is Cinema?, Vol. 1*, trans. Hugh Gray (Berkeley: Univ. of California Press, 2005).
[89] Roland Barthes, "Leaving the Movie Theater," in *The Rustle of Language* (New York: Hill & Wang, 1975/1986), 345, 347.
[90] Vilém Flusser, *Immaterialism* (Metaflux, 2015), 35.

unseat the affective impact of the visual spectacle, to tame the magic Flusser locates as inherent to imagery. The sight of a specter, even if its production is rationally explained, may manifest a deeply uncanny viewing experience — one that lasts longer than the viewing itself, potentially haunting even (or especially) a Polytechnic spectator long after the haunting moment. Several years into the popular run of Pepper's Ghost at the Polytechnic, a columnist at the weekly Fun (a competitor to Punch) described a presentation of the illusion before adding, gravely, that "what they prove to be all nonsense and pieces of glass haunt two or three of my friends terribly" and that one of those friends, since seeing the sight and hearing Pepper's explanation nonetheless "sits half the day thinking he is pursued by devils of all colours."[91] The first significant chroniclers of the uncanny, Ernst Jentsch and Sigmund Freud (as discussed in my Introduction), identified it as an experience that was not merely momentary. Jentsch, in particular, suggests that an uncanny impact lingers beyond the original phenomenological experience of its trigger, adding that "sensitive souls" find that an image or object that has evoked the uncanny "has the ability to retain its unpleasantness after the individual has taken a decision as to whether it is animate or not."[92] In other words, the seemingly supernatural object evoking the uncanny continues to haunt a spectator even after its plainly natural causes have been explained, and this is a prominently phenomenological feature of each case in the following chapters of this dissertation — technical ghosts whose disenchanted origins are clearly explained but that nonetheless produce significant, situated enchantments. "Indeed, even when they know very well that they are being fooled by merely harmless illusions," Jentsch asserts, "many people cannot

[91] Newspaper clipping, "Monday Out," *Fun*, Dec. 3, 1870, 'Press cuttings,' 4-1, p.41, Royal Polytechnic Institution archives, University of Westminster, London.
[92] Ernst Jentsch, "On the Psychology of the Uncanny," *Angelaki: Journal of the Theoretical Humanities,* 2, no. 1 (1906/1997): 12.

suppress an extremely uncomfortable feeling when a corresponding situation imposes itself on them."[93] The uncanny visual haunts and keeps haunting.

That is true, at least, of the particular visual of Pepper's Ghost — though not right away. Pepper's illusion enjoyed a decade of solid popularity at the Polytechnic, but given its limited narrative usage, logistical challenges, and comparative expense, Pepper's Ghost did not become a ubiquitous special effect in dramatic theaters. By the end of the decade, Pepper's Ghost eventually haunted its home only as a rote spectacle, an encore added to enrich other fare. Newspaper reports about other Polytechnic programs practically sighed their final lines: "The explanation of the Ghost, as usual," after a lecture on war technologies[94] and another noting, "of course, the piece finishes by introducing the Polytechnic Ghost."[95] Pepper's obituary even mentions the doubled edge of his illusion's popularity, saying when he traveled America "he was compelled to wind up every lecture with this illusion without regard to the subject matter of the lecture."[96] Perhaps this contributed to Pepper's move to Australia in 1879, where he spent his penultimate decade practicing cloud seeding in an effort to materialize rain. By the turn of the century, the Pepper's Ghost illusion was relegated to fairground attractions, and the popular projection of the virtual was taken over handily by cinema.

Sending forth the viewing subject enlightened but bewildered

Pepper's demonstration of an uncanny interaction with a projected specter signifies a profound rupture in the history of visual representation and an early step toward the experience

[93] Ibid., 9-10.
[94] Photocopy of newspaper page, "Royal Polytechnic," *The Illustrated London News*, Nov. 26, 1870, p.538, 'Photocopies of extracts from the Illustrated London News,' 7-21-1, Royal Polytechnic Institution archives, University of Westminster, London.
[95] Newspaper clipping, "Royal Polytechnic," unknown source, April 7, 1874, 'Press cuttings,' 4-1, p.50, Royal Polytechnic Institution archives, University of Westminster, London.
[96] Wilkie, 74.

of and participation in technical virtuality — of not just experiencing a metaphorically spectral encounter but of physically acting *with* an enacted specter — that has continued to emerge through similar apparatuses and technologies in the century and a half since the Polytechnic spectacle. Before the return of Pepper's Ghost in the 21st century, other media (both actual and imaginary) have attempted to negotiate interactions with their spectral, technical imagery by hailing a viewing subject possessing that double vision sought by the Polytechnic, seeing its specter as scientific. If science was bidding to take over the haunting of the world, then Pepper's demonstrations provided teachable moments — little morality plays, of a sort, vignettes through which audiences were able to watch and potentially learn from depictions of proper manners and behavior in the presence of what are eventually revealed to be entirely natural, technical specters. The narrative content of the Polytechnic plays (which rarely evolved) was not the point; rather, the public demonstration of the visual form, its potential social positioning, and the depicted actions of the spotlighted viewing subject communicated larger discourses about the inherent spectrality of modernity's knowledge-production and communication practices. Indeed, technology can mediate communication in ways that may *seem* eerie and ghostly, but Pepper's performances — particularly the reveal of the technical projection more than the old-fashioned (even then) ghost stories — presented these encounters as something to expect amid this new era and be comfortable with. Pepper's Ghost began the slow, steady emergent process of naturalizing its audiences to spectral, technical imagery, which would also emerge through other systems, from film to television to video.

This is not necessarily the naturalization process Polytechnic lecturers were aiming for. On the surface, Pepper and the men[97] at the Polytechnic simply sought to expose the fraud of spiritualist mediums and to educate Victorian Britons to the chicanery and swindle of the séance (the popularity of which in Europe and America rose and fell in remarkable correlation to the lifespan of institutes like the original Polytechnic). While Pepper carefully designed his showcases of scientific principles and discovery as contributions toward an empire's mission to transform its citizenry into modern, science-minded subjects, his use of Pepper's Ghost as a tool of this ideology surfaced this inherent contradiction within the emerging modern subject they also were helping to shape — one that accepted a swirl of mystery in their modernity, an attitude toward the world that is, as Jo Collins and John Jervis describe in their collection about *Uncanny Modernity*, "as much about imagination as about bricks and mortar."[98] In addition to fusing the ancient idea of ghosts with newfangled technologies, Pepper's systematic and pedagogical reveal of his ghost illusion required a viewing subject who could be at once entertained *and* instructed, mystified *and* undeceived, enchanted *and* disenchanted. The practices of the Polytechnic programmed their subjects with a built-in cognitive dissonance, an embodiment of Octave Mannoni's later formula for fetishism (*I know well, but all the same …*[99]), F. Scott Fitzgerald's maxim ("the test of a first-rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function," an observation he made "when I saw the improbable, the implausible, often the 'impossible,' come true"),[100] or particularly Terry Castle's

[97] The Polytechnic was dominated almost entirely by male lecturers, though women appeared regularly on programs in theatrical and musical capacities. See feminist critiques of science lectures and demonstration by Jordanova, and Rita Felski, *The Gender of Modernity* (Cambridge, Mass.: Hardvard Univ. Press, 1995).
[98] Jo Collins and John Jervis, eds., *Uncanny Modernity: Cultural Theories, Modern Anxieties* (New York: Palgrave Macmillan, 2008), 5.
[99] Octave Mannoni, "Je Sais Bien, Mais Quand-Même ... ," in *Clefs Pour L'imaginaire Ou L'autre Scène* (Paris: Editions due Seuil, 1969).
[100] F. Scott Fitzgerald, *The Crack-Up* (New York: New Directions, 1936/1993), 69.

peculiarly modern state of "enlightened bewilderment."[101] The effort toward enlightenment (particularly when producing rational explanations of invisible phenomena) lends itself toward bewilderment and, for Castle, "the very psychic and cultural transformations that led to the subsequent glorification of the period as an age of reason or enlightenment — the aggressively rationalist imperatives of the epoch — also produced, like a kind of toxic side effect, a new human experience of strangeness, anxiety, bafflement, and intellectual impasse."[102] Enlightened bewilderment, Castle says, is the same "paradoxical state" Freud calls the uncanny, a phenomenological encounter with something unexpected, repressed, or potentially spectral. Bewitched and bothered, the situated viewing subject of the Polytechnic found that, as Castle laments, "[t]he more one understands, the less clear — one finds — things are." Castle, however, immediately indicates hope for that clarity, suggesting that "one can nonetheless organize what one doesn't understand. Bewilderment may be modified, or lightened."[103] Lightening their audience's bewilderment — by modifying it through explanatory, rational framings — is precisely what Polytechnic lecturers such as Pepper sought to achieve: to regulate the experience of a conjured specter in order to then modify its understanding with its own brand of sanctioned knowledge practices. By demonstrating not only the dominance of science over the natural world but also over the hollow category of the supernatural, Pepper and his colleagues did indeed assist in shaping a new, modern subject — not a purely rational one lacking superstition, but one accepting of spectral experiences delivered instead through modern technologies. For certain subjects in certain emergent situations, that is, being bewitched and bewildered is not necessarily a bother.

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[101] Castle, 19.
[102] Ibid., 8. See also the Colling and Jervis anthology based on the same thesis equating modernity with the uncanny.
[103] Ibid., 19.

Chapter 2:
‘Enter holography’:
Practicing merged spaces at a hologram museum

> Come, let me clutch thee: —
> I have thee not, and yet I see thee still.
> Art thou not, fatal vision, sensible
> to feeling as to sight!
> — *Macbeth*

The Museum of Holography (MoH) existed in New York City from 1976 to 1992,[1] exhibiting holograms — three-dimensional images created through a complex holistic technical process distinctly different from traditional photography — and, like the Polytechnic, presenting the spectator’s experience of the images within a specific discursive frame. Contrasting with the strict modernity of the Poly,[2] the MoH’s presentation of this new image form surfaced certain

[1] A year after the Museum of Holography closed in New York City, its entire collection and all of its documents were purchased by the MIT Museum in Cambridge, Mass., where it exists today as an archive. This chapter is based on data collected from that archive — including the museum’s permanent collection of more than 2,000 holograms, as well as a significant cache of documents covering the museum’s foundation, administration, exhibits, correspondence, catalogs, publication, news clippings, and educational efforts. I twice visited this archive for the purposes of this research in August 2015 and July 2016. With the guidance of MIT Museum Co-Director Seth Riskin, I was given access to all the archived documents and was shown approximately two dozen holograms (including stereograms) of my own selection. For more information about the collection, see https://mitmuseum.mit.edu/collection/art.

[2] The century-wide historical gap between Chapter 1 and Chapter 2 of this dissertation should not imply that struggles with the merging of real and virtual spaces disappeared from Western cultures between the 1860s heyday of Pepper’s Ghost at the Polytechnic and the 1970s display of emerging aesthetic optical holography at the MoH. Like many of the visual experiments that flourished during the Victorian era, Pepper’s Ghost faded from popularity in the late 1800s just as cinema became established as a dominant code for moving visuals offering encounters (albeit more segregated ones) with the virtuality of technical imagery. As my study seeks to focus on the *real virtuality* that is produced as a projected, embodied visual on *this* side of a surface or screen, there is simply less to examine as actual holopresence in these intervening decades (at least within the scope of a project such as this). As explicated in my Introduction, Jeffrey Sconce’s work (*Haunted Media: Electronic Presence from Telegraphy to Television* (Durham & London: Duke Univ. Press, 2000)) and other studies ably deal with the spiritualism inherent in the experience of emerging electronic media such as radio and television during the early 20th century, and numerous scholars have addressed the material interventions and phenomenological challenges of the 3D movie fad of the 1950s (look to Blake Lucas, "Ui Sci-Fi: Studio Aesthetics and 1950s Metaphysics," in *The Science Fiction Film Reader*, ed. Gregg Rickman (New York: Limelight, 2004); Kurt Cline, "A Phenomenology of 3-D Cinema," *Glimpse* 15 (2014); Lance Speer, "Before Holography: A Call for Visual Literacy," *Leonardo* 22, no. 3/4 (1989)) Shortly before this case of optical holography, the “imagineers” creating attractions and spectacles at Disney theme

tensions between traditional museum practices and more mobile, embodied ways of engaging with imagery, which intersected with discourses of a nascent postmodernity nurtured around the holograms themselves. Organizers at the MoH initially sought to downplay the kind of technical reveal that was more requisite for John Henry Pepper and the scientists at the Polytechnic — or at least they tried to reposition it within the spectator's phenomenological experience of the novel imagery as the setup rather than the punchline. Ultimately, though, the MoH crafted exhibit spaces in which the educational information and the wondrous encounters (texts about the science *and* spiritualism) coexisted in fresh and productive ways that were essential to training spectators in how to see spectral images and — in the process of mobilizing and physically interacting with the liminal figures — to experience a degree of spectrality themselves.

In this chapter, I examine several discourses cultivated consistently by artists and organizers at the Museum of Holography about the revolutionary potential of hologram imagery as a communication code (presaging the claims of Vilém Flusser about technical imagery's intrinsic cultural disruption, as discussed in my Introduction), and I unpack specific practices employed by the museum intended not only to convey that radical novelty but to teach spectators how to look at and see the hologram. By looking at the design of MoH galleries for the exhibition of holograms, we can see diversions from established conventions of displaying

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parks did much to advance this study's themes of technically constructed mixed realities, from the enchanting animism of animatronic performance to a significant popular revival of the Pepper's Ghost illusion, which continues to show dancing ghosts to visitors of the Haunted Mansion phantasmagoria at Disneyland (I covered this and more as a history of virtual performance in my master's thesis, Thomas H. Conner, "Rei Toei Lives!: Hatsune Miku and the Design of the Virtual Pop Star" (University of Illinois-Chicago, 2013); see also the extraordinary history of Frank Thomas and Ollie Johnston, *Disney Animation: The Illusion of Life* (New York: Abbeville, 1981)). I could have limited this dissertation to the cluster of contemporary cases in this and the following chapters; however, given that the Tupac "hologram" of Chapter 4 is a fairly faithful revival of Pepper's original 19th-century apparatus, reaching back to that case in Chapter 1 provides me support for a larger claim that some of the social unease about the immateriality of technical mediation fueled *both* uses of that illusion and speaks to each emergence of holopresence examined here.

traditional imagery that are specific not only to a viewing subject's ability to look at a hologram but to imparting a specific experience around and with the imagery that conveys certain ideas about its progressive and uncanny differences. Within these carefully constructed spaces for the viewing of spatial imagery, I also explicate numerous discursive texts presented in the galleries, in exhibit publications, and in internal museum documents that constitute a particular pedagogy for training viewing subjects to be holosubjects — activating the mobility required to "find" the hologram, to interpret meanings from its dimensionality, and to acquire an appreciation of the subjective experience afforded by that movement, as distinct from what aesthetic holographers saw as the more controlled viewing position of classical perspective and traditional imagery. Inherent in these discourses and practices are notions about the formation of a specific viewing subject who experiences both a renewed sense of embodiment in learning how to move their viewing body through space in certain ways as well as a greater sense of their own spectrality afforded by opportunities to look at, through, and even — by merging the material body with the overlaid spatiality of the 3D image — *from* the actual perspective of the hologram.

Framing the aesthetic hologram within its emergent subculture

As the first major institution to display holograms in an aesthetic context, a primary goal of the Museum of Holography was to showcase the work of aesthetic holographers and, in so doing, curate a concept of holographic aesthetics. Optical holograms first had been theorized (in the late 1940s) and eventually actualized (in the early 1960s) within the domain of physics, as a means of increasing the resolution of electron microscopes; as such, they were scientific objects, with strict technical practices in their production and use. But by the early 1970s, the hologram had not resulted in significant scientific applications or commercial benefits, and its production

and presentation had begun migrating into experimental art communities and visual crafts movements. Any public perception of holograms — which by then remained scant — held them to be novel but highly technical image forms with little aesthetic value. From its founding, the MoH targeted this public perception and (especially within the international art world) sought to reframe holograms as visuals to be exhibited in galleries rather than utilized in laboratories. The scientific roots of holograms were neither denied nor shunned but, rather, situated as one perspective among many around these multi-dimensional images. A statement by the museum's board — in language as broad and ambitious as mission statements by the Polytechnic (as well as iterative of Flusser's description of technical images knack for providing a more complete "encompassing view"[3]) — outlines the institution's calling

> to serve as the worldwide focal point for the collection and dissemination of holograms and historic, scientific, educational, artistic and commercial information about holography in order to increase awareness and understanding of holography on the part of the general public, museum community, those who make holograms and those who use them.[4]

The final phrases of this statement point toward a second primary goal of the museum, which was to bring together social perspectives on holography, both the scientific and the aesthetic (the utilitarian language about "those who *use*" holograms is curiously pointed) with special emphasis on behalf of an emerging artistic subculture. MoH discourses and practices were infused with an anti-establishment worldview shared by countercultural artists in the aftermath of American and European social unrest in the 1960s and early '70s. Sean Johnston's thorough histories of holography chronicle its technical evolution and social relations from a

[3] Vilém Flusser, *Into Immaterial Culture* (Metaflux, 2015), 26.

[4] Summary of exhibit reinstallation, August 1986, Exhibit: *In Perspective*, Box 34, File "Reinstallation 1060," Museum of Holography archives, MIT Museum, Cambridge, Mass., p.1.

critical STS perspective,[5] and Jens Schröter's media-studies work astutely considers the hologram in a larger genealogy of what he calls the "transplane image"[6]; neither, however, considers in depth the countercultural ideologies informing discourses around aesthetic holography and which many artists believed were symbolized *by* holograms themselves. Flusser later aligns his technical-image category with at least a thread of what can be interpreted as Aquarian-age optimism about a cultural transition from communication dominated by linear, discursive texts to multi-perspective and dialogic technical images, and his philosophy is portended at the MoH by its artists' consideration of not only what but *how* a hologram communicates. Such ideals often were extended ambitiously through aesthetic holography; Stephen Benton, inventor of the rainbow hologram and a frequent fixture at MoH, went so far as to claim that lessons of individual embodiment and social perspectives learned through the viewing of holograms might go so far as to free spectators "from the insane violence of global politics."[7] This chapter thus examines the MoH not only as a visual-arts institution but also as part of a larger cultural transformation amid certain legacies of a post-Vietnam counterculture, locating within the museum's discourses and practices a spirit of rebellion against what was seen as a harsh, hegemonic social order, the expression of which we will find relocated to the domain of science fiction in Chapter 3's explication of *Star Wars* and its depiction of holograms within a narrative of "the Rebellion."

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[5] Sean Johnston, *Holographic Visions: A History of New Science* (Oxford: Oxford Univ. Press, 2006); Sean Johnston, *Holograms: A Cultural History* (Oxford: Oxford Univ. Press, 2016).

[6] Jens Schröter, *3d: History, Theory and Aesthetics of the Transplane Image*, ed. Francisco J. Ricardo, trans. Brigitte Pichon and Dorian Rudnytsky, International Texts in Critical Media Aesthetics (New York & London: Bloomsbury, 2014); Jens Schröter, "Volumetric Imaging as Technology to Control Space," *Acta Universitatis Sapientiae, Film and Media Studies*, no. 02 (2010); Jens Schröter, "Technologies Beyond the Still and the Moving Image: The Case of the Multiplex Hologram," *History of Photography* 35, no. 1 (2011). Schröter's perspective, as it were, on this classification parallels my own concentration on the multidimensionality uniquely implied or inherent within Flusser's category of the technical image.

[7] News clipping about Dieter Jung exhibit abroad, "Incredible holographic exhibition" by Evans Chan, *Hong Kong Standard*, Feb. 1, 1984, Box 29, Folder 765 (2 of 2), Museum of Holography archives, MIT Museum, Cambridge, Mass.

The formation of the MoH in the wake of this countercultural flowering occurred, like the Polytechnic in the mid-1800s, amid a moment of historical flux concerning the nature, perception, and communicative operation of images, namely photography and cinema; the MoH looked at holograms from a different perspective, seeing them more in terms of the "'theoretical boom' in photography" that Roland Barthes identified as occurring during this decade, including several landmark texts that developed concepts of imagery less as the objective, scientific reality peddled by an institution such as the Polytechnic and more as subjective constructs with significant aesthetic potential.[8] The MoH represents a potent discursive nexus channeling ideas related to a 20th-century extension of the Victorians' "frenzy of the visible"[9] and a re-energizing of the "modernity run riot" that Tom Gunning identifies in pre-cinematic imagery[10] and, again, it is here that Flusser's revolutionary-flavored philosophy about technical imagery maps most directly onto the discourses and practices of one of my cases. Benton referred to holography early on as "dimensional imaging" and actually called it, like Flusser, a "communication code." He introduced the MoH's *Similar Visions* exhibit by saying the image form itself presented "something of the vision they [the artists] shared for the future" and noted that exhibits like these facilitated public education about that futuristic vision,[11] in which communications "would naturally be three-dimensional"; this, he stated matter-of-factly, was "an historical inevitability."[12] Flusser's theoretical classification of technical imagery would come to make similar claims about its hegemonic destiny — specifically, as I'm arguing here, based on the

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[8] See my Introduction chapter p. 21.

[9] Jean-Louis Comolli, "Machines of the Visible," in *The Cinematic Apparatus*, ed. Teresa de Laueretis and Stephen Heath (London: Macmillan, 1980), 122.

[10] Allan Sekula, "The Body and the Archive," *October* 39 (1986): 4.

[11] Handwritten draft of exhibit catalog text by Stephen Benton, "Introduction," Exhibit: *Similar Visions*, (March 21-May 18, 1980), Box 34, File "Catalog 1122," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[12] Typescript draft of text for exhibit catalog, "On *Similar Visions*" by Stephen Benton, Exhibit: *Similar Visions*, (March 21-May 18, 1980), Box 34, File "Press Info 1131," Museum of Holography archives, MIT Museum, Cambridge, Mass.

form's projection into spectator space. He was, however, cautious about the timetable and the pedagogical steps along that trajectory: "We, the ones that witness this revolution, still have not learned to decipher these new images adequately," Flusser wrote. This was the precise perspective of many at the MoH — that holograms were so new and early in their technical development and communicative (certainly aesthetic) potential, that the museum should facilitate learning about them *as they emerged* in the world.

To that end, the MoH sought to provide its public with a space literally and figuratively constructed in which to experience this revolutionary image form — and to learn the new ways required *to* see the new imagery (and thus physically glimpse this dialogic worldview). This required significant pedagogy on behalf of the MoH and strategies of hailing its spectators differently from traditional museums. A painting (or even a television) requires a stationary spectator who gazes through the frame of its medium to have an ideal experience with and within the depicted virtual space beyond. Such a motionless spectator before a hologram will see its spectral image either in front of or behind the plate, but its true dimensional aspect is only sighted when that spectator moves. When viewers of a painting move from one side to the other, they will remain viewing the same flat image; when hologram spectators move, they see different sides and perspectives, sometimes even new interiors. Just as movement of the spectator's seeing body (however slight) was key to their discovery of an illusory third dimension in 19th-century stereoscopic imagery,[13] movement of the viewing subject *makes* the hologram holographic *and* shapes the spectator into a different kind of viewing subject.

Thus, like the Polytechnic, the MoH not only programmed its exhibits with discursive instructions about movement through its spaces, it also constructed those spaces in ritual ways

[13] Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge: MIT Press, 1990).

that nudged and lured spectators into practicing this mobility. Carol Duncan describes the art museum as "a place programmed for the enactment of something" and that its enacting ritual may "even equip visitors with maps to guide them through the universe they construct," to "provide both the stage set and the script" for this enactment, leading to "well-developed ritual scenarios."[14] The MoH enacted its own "values and beliefs … in the form of vivid and direct experience"[15] by equipping its visitors with actual maps and scripts guiding and positioning their viewing bodies through a visual constellation carefully arrayed and ritualized by the museum, all designed to lead spectators toward discovery of a way of seeing imagery that differed from the viewing of other visual forms — enacting a kind of manifesto on behalf of MoH artists and serving as an induction center for spectators of this holographic future, educating visitors not only about the existence of physical and metaphorical dimensions to the imagery but how to "read" them. As will be shown, texts throughout the MoH galleries directed viewers to move about and even dance with the holograms, exhibits were designed to facilitate this movement, and guides present with the exhibit conversed with spectators in ways that nudged them out of fixed subject positions traditional to more discursive displays and toward the discovery of holography's multiplicity of perspective. The MoH was primed and operated to teach spectators the ritual of entering holography — how to move their bodies in order to become new viewing subjects as well as how to surrender some material aspects of experience in order to engage with the spectrality of the hologram.

[14] Carol Duncan, *Civilizing Rituals: Inside Public Art Museums*, ed. Jon Bird and Lisa Tickner, Re Visions: Critical Studies in the History and Theory of Art (London and New York: Routledge, 1995), 8, 12.
[15] Ibid., 2.

From science to art: Holography before the museum

Well before they emigrated to aesthetic contexts such as the MoH, the technique of holographic imaging emerged as an amalgamation of post-war sciences (microscopy, wave photography, and lasers) that by the 1960s had coalesced under the heading of "holography." This is a term that Dennis Gabor re-coined[16] and eventually defined as "the art of freezing a light wave into a photographic plate by means of another (reference) beam, and reviving it by laser or white-light illumination."[17] Briefly, to create an optical hologram an object is placed within an arrangement of mirrors, a particular kind of photographic plate, and a laser. The single laser is divided into two beams, one of which strikes the photographic plate directly while the other is diverted toward the object to be imaged, its reflected light then also reaching the plate. The diffraction pattern of the two beams is recorded in the plate and, once the plate is processed using chemicals similar to regular photography, that pattern may be revived by illuminating the plate, resulting in the reappearance of the object.[18] A hologram, then, is a *replay* of the light waves reflected from an object; it re-presents the object's same size, shape and position when imaged, the difference being that the resulting image is not always true to color and is often semi-transparent.[19] (In addition, a hologram may be a static image appearing within or projecting from

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[16] Dennis Gabor, "Microscopy by Reconstructed Wave-Fronts," *Proceedings of the Royal Society of London, Series A. Mathematrical and Physical Science* 197 (1949) I say recoined because the word emerged from another root, "holographic" writing (see Introduction p. 3).

[17] Dennis Gabor, W.E. Kock, and George Stroke, "Holography," *Science* 173, no. 3991 (1971): 11

[18] My own working knowledge of optical holography is rooted in an internship I conducted with Dinesh & Joy Padiyar at Triple Take Holographics in suburban San Marcos, Calif., during 2015. Here I learned the basic principles and practices (and safety procedures) of creating holograms of objects on a stabilized hologram table in a specially made darkroom on site. After assisting them with a couple of existing projects, I produced several different types of holograms of a personal object of mine: a favorite meerschaum pipe, selected for its particularly "hologenic" qualities (light in color, with intricate surface detailing), plus I was hoping for a bit of a pun: given the ontological shade to claims about holographic imagery in this dissertation, I captioned my hologram series, "*C'est une pipe*," in contrast to Magritte's famous surrealist painting.

[19] Francis A. Jenkins and Harvey E. White, "Fundamentals of Optics," (Nueva York, EUA : McGraw-Hill, 1976); Charles A. Nelson and Frances Degen Horowitz, "The Perception of Facial Expressions and Stimulus Motion by Two- and Five-Month-Old Infants Using Holographic Stimuli," *Child Development* 54, no. 4 (1983).

a flat plate, or it may be an animated series manifested by a strip of clear film, called a multiplex hologram or a stereogram. The animation is activated and controlled by either the automated movement of the stereogram, whose films are often mounted on turntables and illuminated from within, or the movement of the spectator, who activates the animation by moving their viewing body, "playing" it forward or "rewinding" it backwards, and at their particular speed.)

The distinction between the holographic media and the hologram image is important to my understanding of how MoH discourses and practices directed the vision and attention of its subjects. The media of the hologram is, like a painting, a material flat surface that may be hung on walls for display within the general eye level of spectators. The key difference between a traditional image and a hologram, however, is that the latter's technical image — the hologram itself — does not appear on that surface. Holograms are classified in two different ways: according to the light used to replay their imagery and according to the apparent physical location of the image for the spectator. First, while all optical holograms are created using some form of laser, not all holograms are viewed with one; transmission holograms, for instance, activate their imagery when illuminated by another laser, while rainbow or reflection holograms can be seen in normal white light. Secondly, any hologram's actual image may appear to exist either in front of the plate or behind it, depending on the particular arrangement of elements in the imaging apparatus.[20] As shown in **Figure 2.1**, a 3D image that appears behind the plate (beyond the frame and thus out of reach of the spectator) is called a *virtual* hologram, while one

[20] The holographers during my internship (see previous footnote) demonstrated that any type of hologram may produce "real" or "virtual" images depending on the placement of the plate within the arrangement of lasers, mirrors, and other positioning devices on the holography table with the object (or subject) to be imaged. Delicate changes to the plate's location in relation to the laser beam may alter the eventual hologram's position before or behind the plate. Joy Padiyar at Triple Take Holographics said most of the studio's clients ask for "real" holograms — "as far out in front of the plane as possible" — but that the further the hologram image extends forward from the plate the less clear it becomes, slipping out of focus. "If you're doing something that has eyes," she said, speaking of anthropomorphic objects but also including the potential of human subjects, "you have to make sure the eyes are at the clearest point" (personal communication, April 14, 2016). Depending on the size of the object or subject (the depth of the head, for instance), this can complicate making heads or faces protrude very far as "real" holograms.

that appears to hover in front of the plate (within the same space of the spectator, and thus in a position to be reached for) is referred to as a *real* hologram. Looking through the plate at a virtual hologram is similar to viewing a diorama; looking at a real hologram in real space may be similar to viewing sculpture. This difference between and transformation from an allegedly immaterial image appearing on (or in) a surface into one that appears in three dimensions within the material space of the spectator is crucial to this chapter's analysis of claims made by MoH holographers about holography's radical novelty, as well as this dissertation's overall perspective on holograms as technical imagery (as an ideal of Flusser's theoretical category, projecting not only from an apparatus but into real space). As we move from this chapter into the next, we will see the emphasis on the real hologram evolve into the template for science fiction's depiction of the future potential of this kind of technical imagery and its continually emerging efforts to hail a new and different kind of spectator — a viewing subject who may participate in Flusser's "immaterial culture" by, per my Introduction, viewing *real virtuality* rather than *virtual reality*.

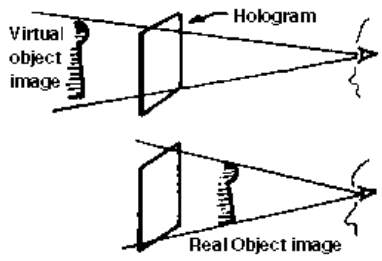

Figure 2.1. This diagram[21] shows the apparent location of the image in two different types of optical hologram: the *virtual* hologram, which appears behind the plate separated from the spectator, and the *real* hologram, which appears in front of the plate with the spectator.

[21] Source: http://www.math.brown.edu/tbanchof/Yale/project14/holotypes.html.

Dennis Gabor's original theory of holography was entirely realist. He was not concerned with the aesthetics of the resulting image, only what information that image might communicate (magnify) about its microscopic target. He sought to make visible what was otherwise invisible. However, at the time he conceived of his imaging technique (1947) and articulated it in a paper the following year,[22] the technology did not exist to realize it. The concept itself remained theoretical,[23] pursued (or, as Schröter says, repeatedly rediscovered[24]) by only a handful of scientists until the independent invention of lasers in 1960 happened to provide the coherent light required for holography to function.[25] By the mid-1960s, however, laboratory holography had yet to establish itself as a widely useful or profitable technical practice.[26] Both Schröter's and especially Johnston's histories of holography are frank about this failure, with Johnston noting that in most scientific "niches," holography's alleged "cohesiveness and boundary-crossing character would escape notice."[27] That same character, however, was entirely motivational within the emerging niche of aesthetic holography, where artistic practitioners sought to differentiate their holography from the initial realist aims of scientists.

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[22] Dennis Gabor, "A New Microscopic Principle," *Nature* 161, no. 4098 (1948).

[23] Paul Kirkpatrick, "History of Holography," *Proc. SPIE 0015, Holography I*, no. 15 (1968).

[24] Schröter, *3d: History, Theory and Aesthetics of the Transplane Image*.

[25] The first application of laser light to realize the holographic effect is documented in two papers (Emmett N. Leith and Juris Upatnieks, "Wavefront Reconstruction with Continuous-Tone Objects," *Journal of the Optical Society of America* 53, no. 12 (1963); Emmett N. Leith and Juris Upatnieks, "Wavefront Reconstruction with Diffused Illumination and Three-Dimensional Objects," *Journal of the Optical Society of America* 54, no. 11 (1964)) — though it's worth noting their prior discussion of the theory was presented in terms of communication theory, discussing the pure "signal-to-noise ratio" of the holographic image (Emmett N. Leith and Juris Upatnieks, "Reconstructed Wavefronts and Communication Theory," *Journal of the Optical Society of America* 52, no. 10 (1962)).

[26] Two industrial uses of holography remain ubiquitous today: Laser-holographic principles form the basis of bar-code scanning, which improved the speed and accountability of on-site commercial sales, and the difficulty of reproducing (counterfeiting) reflection holograms became a boon to credit-card security. These applications, however, were pedestrian compared to the initial speculative uses of holography. Beyond its original potential within microscopy, holography was touted as a significant advance for medical, industrial, and military visualization. The U.S. Air Force funded research throughout the late 1960s that led to designs for a head-mounted display to be worn by pilots and based on holographic principles. These technologies did not take root, nor is Gabor's wave photography a common feature of microscope laboratories today.

[27] Johnston, *Holographic Visions: A History of New Science*, 441.

However, given that holography presents an image that reproduces the surface of its antecedent object or subject in remarkable exactitude, transforming its function into a more expressive abstraction proved to be a considerable challenge. Art historian Melinda Wortz says of holography that its "literal reproduction of a familiar object limits its metaphoric potential,"[28] and this lack of a perceived artistic intervention in holographic imaging fueled the primary criticisms of holograms presented in artistic contexts. (The critique survives even today. During my initial visit to the MIT Museum to examine the MoH archive, the collection specialist commented that holography still "has an aura of diffractive optics and not an aesthetic medium."[29]) Eventually, critics would begin to note "a tremendous change in the content of holograms as artists experiment to see how the medium can be manipulated."[30] That is, holography artists throughout the early 1970s were honing methods to mix and abstract their images in order to make their holograms convey something other or more than the imagery's requisite material antecedents. This was achieved at least to the degree that, by 1975, one of holography's pioneering artists pointedly referred to her work in an exhibit statement not just as (scientific) holography but as "aesthetic holography."[31]

That same year, the burgeoning aesthetic holography community had attained enough critical mass to warrant a significant exhibition. Holograms had been exhibited on small scales in the United States and United Kingdom since the mid-1960s, each event organized by optical

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[28] Exhibit program text, "Notes on Anaït's Sculpture" by Melinda Wortz, Exhibit: *Paradigms Lost* (April 6-June 3, 1979), Box 32, Folder "Anaït Retrospective," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[29] Seth Riskin (co-director, MIT Museum) in discussion with the author, Aug. 5, 2015.

[30] News clipping, "Holography: Simple 3-dimensional objects to abstract light sculptures" by Sharon Broom, *The News & Observer* (Raleigh, N.C.), June 17, 1988, Exhibit: *FutureSight: Innovations in Art Holography*, File "Traveling remount," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[31] Typescript draft of catalog text, "Personal statement" by Harriet Casdin-Silver, Exhibit: *Holography '75: The First Decade*, Box 33, File "Book – Artists' Statements 1025," Museum of Holography archives, MIT Museum, Cambridge, Mass. The technicity of this particular technical image, however, could not be ignored or circumvented. Its production still required collaboration with physicists or negotiated access to scientific laboratories.

scientists (holography pioneers such as Lloyd Cross and Leith & Upatnieks) for their peers.[32] But *Holography '75: The First Decade* functioned to announce aesthetic holography's coming-of-age as an emerging art form. Organized by Joseph R. Burns Jr. and Rosemary H. Jackson in July 1975, it was the first major holography exhibition in New York, featuring holograms by both scientists and artists — as Johnston's history frames it, "the most visible display yet of holograms in an artistic venue, and in a city that prided itself on sophistication and art criticism."[33] Submitting to that criticism, however, did not go well for aesthetic holography's debut. The technical sophistication of the new imagery was roundly noted, but — precisely because of it — critics hated the show. Loudest among these was Hilton Kramer, revered art critic for *The New York Times*, who complained that the "esthetic naiveté of this show must really be seen to be believed," effectively barring holography's entry into the sanctioned art world by repeatedly demoting the exhibitors with quotation marks (not artists but "artists") and damning the new image form as a showcase of "gadget culture" and a mere "technical stunt."[34] Sarah Maline notes that it was "Kramer's discovery that most of the holograms were produced by physicists [that] helped him to summarily dismiss the medium as a technical stunt unfit for public display,"[35] meaning that he wrote off any potential aesthetic value of the holograms on the basis of the participation by scientists in their production. Aside from a lengthy history of debate about the application of aesthetics to imagery in science,[36] these initial holograms were deemed unaesthetic not based on their content but on their process — their medium rather than their

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[32] Johnston, *Holographic Visions: A History of New Science*; Johnston, *Holograms: A Cultural History*.
[33] Johnston, *Holographic Visions: A History of New Science*, 319.
[34] Hilton Kramer, "Holography — a Technical Stunt," *The New York Times*, July 20 1975, D1.
[35] Sarah Radley Maline, "Eluding the Aegis of Science: Art Holography on Its Own" (paper presented at the Proc. SPIE 1600, International Symposium on Display Holography, Lake Forest, Ill., Jan. 1 1992), 217.
[36] See Lisa Cartwright, *Screening the Body: Tracing Medicine's Visual Culture* (Minneapolis: Univ. of Minnesota, 1995); for field-specific summations, see also Clive Cazeaux, "The Aesthetics of the Scientific Image," *Journal of Aesthetics and Phenomenology* 2, no. 2 (2015); Glenn Parsons, "The Aesthetics of Chemical Biology," *Current Opinion in Chemical Biology* 16, no. 5-6 (2012).

message. The hologram of a *Toy Train* by Emmett Leith and Juris Upatnieks,[37] for instance, is a landmark more for its technical accomplishment (the resolution and quality of the resulting dimensional image) than for any communicative ideas in its imagery (a simple, unadorned reproduction of a plastic model). This lack of visible artistic merit soured critics, who deemed holography not yet ready for artistic primetime.

Aesthetic holographers responded to this criticism vociferously. *The New York Times* published several letters to the editor countering Kramer's viewpoint,[38] and the review served as a frequent reference point in catalog texts for future aesthetic holography shows. Later that summer, Jackson solicited additional texts from artists and critics to fill out a book version of the *Holography '75* exhibit catalog for sale. Cornell Capa, the founder and then-director of the International Center for Photography where the exhibit was held, wrote an exhibit afterword for the book that responded directly to Kramer's critique.[39] Capa concedes Kramer to be "completely right about holography" in terms of the imagery's realism seeming to overshadow its aesthetic aspect. But he counters with a common comparison to photography: "The really magical thing about photography is not its optical reproduction of reality, but its abstraction." Stereoscopes and early three-dimensional photography, he said, never caught on widely "because the three-dimensional image shows too much, because it leaves so very little to the viewer's own imagination." Holograms are, indeed, "damnably realistic" — so much so that one "leaves no

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[37] Emmett Leith and Juris Upatnieks, *Toy Train,* 1963. 5 in x 4 in x 1/4 in. National Museum of American History.

[38] News clippings of letters to the editor in The New York Times, Aug. 3, 1975, Box 38, File "Non-MoH exhibits, File 1180," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[39] Capa's piece may or may not have been published in the resulting exhibit book. The second draft of its typed text in the MoH archive includes a handwritten note by Jackson at the top: "Incredible! We were shocked! He decided not to print it" (typescript draft of correspondence from Cornell Capa to The New York Times, undated, Exhibit: *Holography '75: The First Decade*, Box 33, File "Book Prologue Letters file 1022," Museum of Holography archives, MIT Museum, Cambridge, Mass.). A later formal outline of contents proposed for the book, however, lists Capa as a contributor, though without any identifying title (typescript draft of catalog outline, "Outline for Catalog, *Holography '75: The First Decade*," dated July 1976, Exhibit: *Holography '75: The First Decade*, Box 33, File "Prologue Statements file 1023, Museum of Holography archives, MIT Museum, Cambridge, Mass.). I have been unable to locate a published copy of this catalog.

room for anything else than its own reality."[40] Nonetheless, Capa concludes that the new image form cannot be ignored, though his reasons are thin, relying on exactly the technical aspect of holograms that Kramer and others criticized. He ultimately retreats into misty claims of radical novelty, saying holograms are a "miracle, this image that defies everything he [Kramer] knows about the limits of optical possibility."[41] What this new possibility is, he does not say, but the potential of exploring it allowed Jackson and Burns to channel the public exposure and artistic momentum of *Holography '75* into the creation and founding of the Museum of Holography within the year, with Jackson as the MoH's formative director. Confident that holograms represented a radical new form of visuals, if not of human communication writ large, the museum's organizers secured funding and exhibition space in Manhattan.

Designing for holopresence: Making room(s) for holosubjects

The Museum of Holography opened in January 1976 on the second floor of a seven-story office building at 120 W. 20th St. in New York,[42] a block of nondescript offices and apartment buildings. By autumn, the museum had joined a wave of art organizations colonizing the gritty SoHo neighborhood[43] and moved into what would become its permanent home, 11 Mercer St., a wide, five-story building with welcoming, trimmed windows and grand, red columns along its

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[40] Typescript draft of correspondence from Cornell Capa to *The New York Times*, p.1.

[41] Typescript draft of correspondence from Cornell Capa to *The New York Times*, p.2.

[42] This location was the original site of a small holography gallery started by Burns. See Richard F. Shepard, "Holography Takes Root in Soho in a Museum Devoted to Future," *The New York Times*, Dec. 29 1976.

[43] Sharon Zukin, *Loft Living: Culture and Capital in Urban Change* (New brunswick, N.J.: Rutgers Univ. Press, 1989); Aaron Shkuda, *The Lofts of Soho: Gentrification, Art, and Industry in New York, 1950-1980* (Chicago and London: Univ. of Chicago Press, 2016). Neither book mentions MoH directly, but one can situate MoH's opening amid Shkuda's tables of dramatic correlations between increases in the number of residential arts organizations and climbing real estate values peaking in the late 1970s. As eulogized by artist and MoH exhibitor Richard Kostelanetz, SoHo was "particularly hospitable to art forms that were new in the 1960s and 1970s: video, holography, and book-art," and he signals the closing of the MoH in 1992 and the sale of its collection to MIT as a "sign of the end of Artists' SoHo" (*Soho: The Rise and Fall of an Artists' Colony* (New York and London: Routledge, 2003), 149, 152). See also Siegfried, Alanna, and Helene Z. Seeman. *Soho: A Guide*, New York: Neal-Schuman, 1978.

90-year-old, cast-iron façade. The MoH inhabited the second floor and some of the basement. Its arrival here was regarded significantly enough that Mayor Abraham Beame[44] cut a ribbon to open the site on Dec. 12, and the first MoH exhibition showcased 75 holograms to several hundred visitors.[45]

The Mercer Street location, which the MoH would inhabit for the rest of its life (closing on March 1, 1992), was typical of a type of emerging exhibition space specific to New York City at the time. Like other spaces attracting artists to SoHo, the MoH exhibit rooms were lofts: large upper floors (sometimes basements) with open space unobstructed by walls or partitions, maybe only a few support columns, previously used as industrial "dead storage."[46] As local artists converted these cheap spaces (often living in them, legally or otherwise) and rehabilitated them to be more "homey and chic,"[47] they contributed to the emergence of a new kind of display space for art. Following the salons of the 18th century — with walls often so crowded by paintings their surfaces were completely covered — the display of art had evolved from comparatively cluttered public museums and busy private curiosity cabinets in the 19th century to 20th-century public spaces erected and treated as ritual temples[48] and smaller gallery experiments by Frederick Kiesler and László Moholy-Nagy.[49] The Bauhaus-perfected "white cube" exhibit space would come to dominate art display by the 1980s,[50] but the cavernous lofts in SoHo and elsewhere contributed partially to the normalizing of art display within unobstructed spaces — spaces that,

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[44] It is sufficiently pun-worthy that a museum showcasing art made with lasers was sanctioned by a government official named Beame. But the mayor's involvement with the museum was not a flash-in-the-pan, as it were. His was the first face to be captured for the following year's exhibit of hologram portraits, the *Hol-O-Fame* — a title the mayor himself coined (see http://holoexhibitions.blogspot.com/1977/09/).

[45] Johnston, *Holographic Visions: A History of New Science*, 337.

[46] Kostelanetz, .

[47] Shkuda, 6.

[48] Duncan, .

[49] See Fernando Domínguez Rubio, *Still Life: Ecologies of the Modern Imagination at the Art Museum* (Chicago & London: Univ. of Chicago Press, 2020).

[50] Ibid.

as Duncan says of 20th-century museums, "increasingly sought to isolate objects for the concentrated gaze of the aesthetic adept."[51] In the case of the MoH, loft spaces allowed viewing subjects this kind of focus for their gaze, but they also opened up ample room for a new kind of spectator to maneuver around, by, and, as we shall see, *through* the holograms. Such movement was key to the museum's claims about artistic meaning conveyed not just by the content of holograms but by the medium itself.

On Mercer Street, the MoH inhabited the second floor and basement, with four gallery spaces on both levels eventually featuring three permanent exhibits and one alternating. Regardless of the layout of the spaces — some, according to archived floor plans and exhibit diagrams, were L-shaped and some the usual featureless rectangle — the MoH galleries were large, unobstructed spaces (see **Figure 2.2**); a 1981 sketch of the "Main Gallery" is marked out to be approximately 26-by-36 feet[52] while a 1988 exhibit outlines a 35-by-53-foot room.[53] The largest exhibits were able to display up to 50 or 75 holograms. Exhibits often were designed with holograms spaced liberally along the walls, and later some would be positioned on pedestals throughout a room, sometimes flanked by a bar and a coat-check table, with both of those around the corner from the requisite "bookstore area."[54] Most MoH plans and diagrams mark perimeter measurements and distances between walls, entrances, and corridors, with occasional notations marking infrastructure locations (lighting, exit signs, elevators, the swing range of doors, etc.). Sometimes that infrastructure is unique to the display of holograms — whether illuminating them with regular white light (plans sometimes show the placement of a "single 100 watt

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[51] Duncan, 17.

[52] Correspondence from Rosemary Jackson to Sam Moree, Aug. 10, 1981, Exhibit: *Flux*, (Feb. 12-May 9, 1982), Box 32, Museum of Holography archives, MIT Museum, Cambridge, Mass.

[53] Hand-drawn floor plan of gallery design, Exhibit: *The Holographic Instant: Pulsed Laser Holograms* (May 15-Oct. 16, 1987), Box 32, File "1017," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[54] Hand-drawn floor plan of gallery design, Exhibit: Permanent, Box 34, File **"**Permanent Exhibit Plans 1094," Museum of Holography archives, MIT Museum, Cambridge, Mass.

monofilament" behind the hologram[55]) or with a laser, usually aimed from behind[56] and often encased within shielded enclosures marked "light tight."[57] Little else about the layout of the physical space gives away anything unusual or necessarily revolutionary about the artifacts to be displayed within.

[55] Hand-drawn floor plan of gallery design, Exhibit: *Light Years III* (Dec. 11, 1980-Nov. 29, 1981), Box 34, File "Exhibit Lists and Info 1075," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[56] Ibid.
[57] Hand-drawn diagrams of how to set up lasers for specific hologram displays, Exhibit: *The Holographic Instant: Pulsed Laser Holograms* (May 15-Oct. 16, 1987), Box 32, File "1017," Museum of Holography archives, MIT Museum, Cambridge, Mass. The "light tight" specification not only indicated the correct function of the display but also policy requirements listed in another document within the same file titled "New York State Guidelines for Laser Light Shows." Also in this folder (perhaps misfiled, given its date of Nov. 3, 1983) is correspondence to the museum from Francis J. Bradley, Principal Radiophysicist at the New York State Department of Labor, clarifying the inspection of "Laser Safety Officers" at the museum.

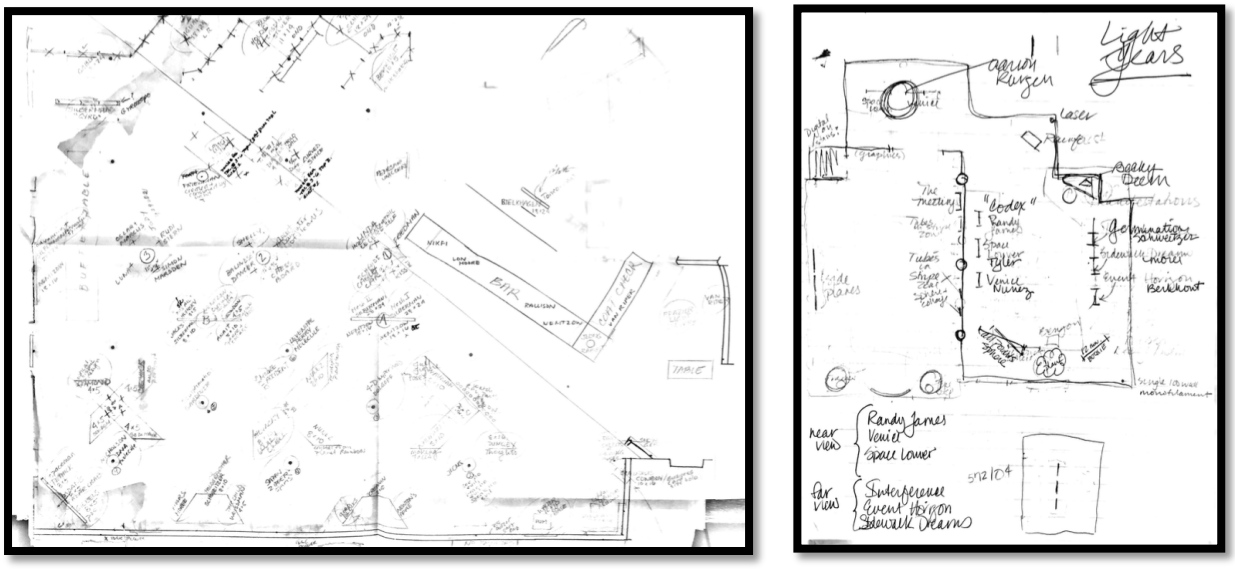

Figure 2.2. These floor plans of MoH exhibits selected from the museum archive give a general sense of how viewing spaces were constructed for hologram display. The first hand-sketched layout for the permanent exhibit[58] (left) shows holograms both spaced along the gallery walls as well as on pedestals dotted throughout the space. The second[59] (right, for *Light Years III*) highlights the gallery's lighting infrastructure that is key to determining how certain types of hologram might be displayed, such as the "Laser" required for the hologram labeled *Rainforest* near the top of the diagram or the "single 100 watt monofilament" lamp positioned behind the hologram in the lower right corner.

The design of exhibits within these spaces accounted for ways a MoH subject's viewing experience of holograms differed from that of paintings or even sculpture. As a three-dimensional image hovering in mid-air, a hologram (as described in the context of the MoH's operations) hails spectators to move their bodies considerably more than the fixed positioning of classical perspective depicted through two-dimensional media. This spectator movement — around the holograms, sometimes backing away from them or moving in quite close, even bending underneath or standing on tiptoes to view from above — must be attended to in the

[58] Hand-drawn floor plan of gallery design, Exhibit: Permanent, Box 34, File "Permanent Exhibit Plans 1094," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[59] Hand-drawn floor plan of gallery design, Exhibit: *Light Years III* (Dec. 11, 1980-Nov. 29, 1981), Box 34, File "Exhibit Lists and Info 1075," Museum of Holography archives, MIT Museum, Cambridge, Mass.

design of an exhibit of holograms, and the MoH both accommodated and hailed this extra mobility. Measurements on MoH exhibit designs chart not just the distances between holograms on the wall but marking out distances behind the displays, as if assuring room for spectators in motion between holograms on facing walls. One exhibit of stereograms is depicted in plans as a room dotted with the small circular displays evenly spaced around the exhibit room, allowing for free circulation and 360-degree views.[60] MoH exhibit designs don't just account for the mobility of their spectators as they transport themselves from viewing one artwork to view another — they allow for the spectators' mobility *while viewing* the art.[61]

MoH floor plans facilitated this necessary mobility by directing the viewing subject *around* the exhibit rooms rather than *through* them. Gallery walls at MoH often were remodeled with angular surfaces, and the openness of the galleries' constructed loft spaces usually was filled with strategically placed partitions and artworks. Importantly, these designs directed spectators to move through the spaces alongside the displayed holograms rather than approaching them frontally. The MoH's first permanent exhibit filled its gallery with holograms throughout the space, its floor plan looking like a large Plinko board, leaving spectators to snake through and around a multitude of vertical panels and pedestals in any pattern other than straight lines.[62] Instead of being flat, one entire side of the gallery for the *Similar Visions* exhibit in 1980

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[60] Hand-drawn floor plan of gallery design, Exhibit: *Holodeon* (Sept. 16-Dec. 31, 1977), Box 33, File "Loan Forms 1013," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[61] The mobility being described here is based on a highly conventional understanding of the viewing subject, based on much longer histories of artwork display. The archived materials showing gallery layouts and exhibit design are unclear as to any accommodations made for different viewing and mobile abilities. The MoH shuttered just one year after the passage of the Americans With Disabilities Act, though at least one 1982 grant application to the NEA in the archive shows the museum agreeing to prevent broad discrimination based on the Civil Rights Act of 1964 (Organization Grant Application Form NEA-3, June 29, 1981, Exhibit: Portrait Gallery, Box 34, File "Contracts, Loan Forms, Plans 1109," Museum of Holography archives, MIT Museum, Cambridge, Mass.). Otherwise, the language of MoH exhibits may be read largely as ableist in either assuming a normative spectator mobility or through its overall lack of discussing the matter.

[62] Hand-drawn floor plan of gallery design, Exhibit: Permanent, Box 34, File **"**Permanent Exhibit Plans 1094," Museum of Holography archives, MIT Museum, Cambridge, Mass.

was designed as a jagged row of 90-degree angles, so that even if a spectator approached one hologram directly they would then be passing by another to one side (**Figure 2.3**). The remainder of the gallery for that show was blocked with central constructions containing various visual demonstrations and a film projection, forcing spectators to move either clockwise or counterclockwise through the rectangular space.[63] Galleries for *The Holographic Instant: Pulsed Laser Holograms*, the MoH's 1987 portrait show, greatly exaggerated the angles of its rooms — in one, placing four themed constructs across the middle of the rectangular room so that even holograms hung along the exterior walls couldn't be approached straight on and, in another, hanging two-thirds of the displayed holograms on constructed walls at wildly varying sharp angles crafting a veritable trigonometry of spectator movement. Viewing subjects, then, were possessed with a mobility different from that of traditional imagery, but it is a mobility that is still controlled and directed to some degree and at specific angles that facilitated the museum's goals of discovery. In this viewing mode, MoH spectators would discover the spatial nature of the holographic image conjoined to their viewing space or existing in that space with them and, in exploring that space by moving their bodies further, they would discover themselves in a relationship different from that with traditional imagery.

[63] Hand-drawn floor plan of gallery design, Exhibit: *Similar Visions* (March 21-May 18, 1980), Box 34, File "Floor Plans 1127," Museum of Holography archives, MIT Museum, Cambridge, Mass.

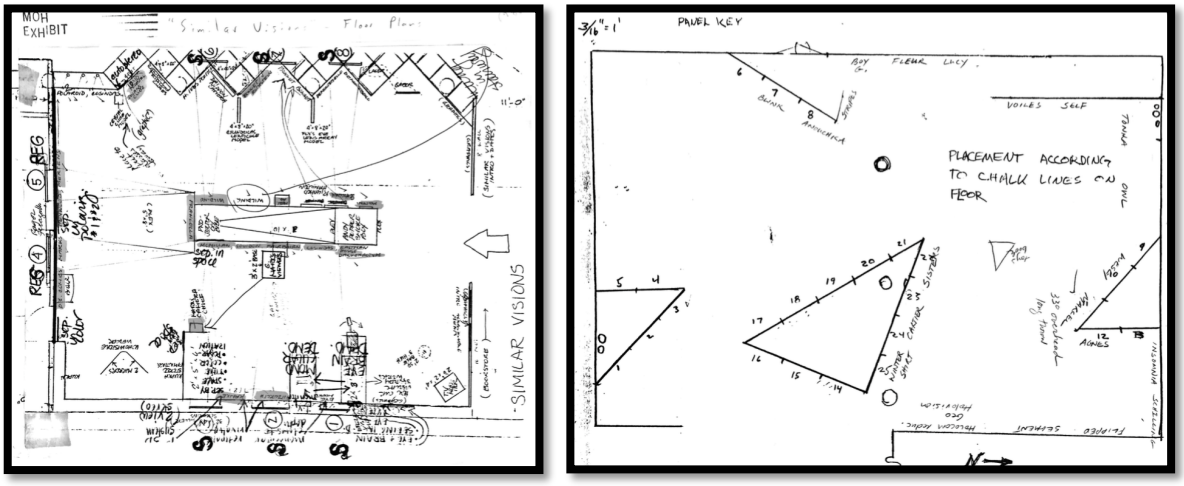

Figure 2.3. These MoH exhibit floor plans highlight the angularity inherent to much of the design for hologram displays. In the first (left)[64], for the *Similar Visions* exhibit, jagged angles along the top wall lead spectators both toward individual holograms by necessarily passing another (the better to "catch" the movement and dimension of the imagery) or present the cluster for more active viewing from further away. The second (right)[65], from *The Holographic Instant*, shows a holistically sharp-cornered design facilitating spectator movement at hard angles that might show off a hologram's dimensionality.

In addition to spectator interaction with the artworks, holograms at the MoH often were placed in specific relationships between the imagery and the space itself. The aspect of a hologram's projected imagery can vary — one might appear with greater clarity or spatial presence when viewed from, say, the right side as opposed to the left — and some MoH exhibit diagrams seem to account for this in the placement of the artworks. In a scrawled-over plan for Anait Stephens' *Paradigms Lost* mixed-media exhibit in 1979, lengths of walls are left unmarked for a variety of sketches and holograms (sometimes the plans refer to marks in the actual room, e.g. "placement according to chalk lines on floor"[66]), but certain pieces are labeled for specific

[64] Hand-drawn floor plan of gallery design, Exhibit: *Similar Visions* (March 21-May 18, 1980), Box 34, File "Floor Plans 1127," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[65] Hand-drawn floor plan of gallery design, Exhibit: *The Holographic Instant: Pulsed Laser Holograms* (May 15-Oct. 16, 1987), Box 33, File "1016," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[66] Hand-drawn floor plan of gallery design, Exhibit: *The Holographic Instant: Pulsed Laser Holograms* (May 15-Oct. 16, 1987), Box 33, File "1016," Museum of Holography archives, MIT Museum, Cambridge, Mass.

locations; *The Hatched Egg* is positioned next to the exhibit's title graphics (symbolizing holography's emergence?), while an early bronze sculpture *Reaching Man* is coupled closely with the hologram *Life Cycle*, the one reaching toward the other (implying an artistic trajectory?).[67] Interplay designed between hologram images and other objects, such as sculpture, suggests that the viewing subject here also may exist on or have entered a new space of interaction with an image, something that actually was elemental in Stephens' artistic philosophy. She referred to her holographic art not as "works" to look at but as "environments" to inhabit.[68] In an autobiographical account of her transition from sculpture to holography written for the art journal *Leonardo* (and quoted in the *Paradigms Lost* program[69]) she describes the mingling of holographic imagery with real space as a viewing experience that is "both visually and mentally challenging" because "[t]he viewer's focal point can shift from the hologram to distant points beyond it, reinforcing the awareness of the 'light sculpture' in space"; this conflation of the space of the image with the space of the spectator — the act of "hanging 'space' on a wall" — allowed at least Stephens, as an artist, to "free myself from the restrictions of ordinary 3-dimensionality; the projecting and receding images make space seem more solid to me and its confinements less so."[70] The unification of spectator and image spaces, however, depends on sufficient room for the MoH's mobile viewing subject to catch sight of the hologram's dimension and complexity, and then move around in order to explore its content and read its space. The roomy design for *Paradigms Lost* easily facilitates this.

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[67] Hand-drawn floor plan of gallery design, Exhibit: *Paradigms Lost* (April 6-June 3, 1979), Box 32, File "Anait Retrospective," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[68] Anaït A. Stephens, "My Art in the Domain of Reflection Holography," *Leonardo* 11, no. 4 (1978): 306.
[69] Printed exhibit program, Exhibit: *Paradigms Lost* (April 6-June 3, 1979), Box 32, File "Anait Retrospective," Museum of Holography archives, MIT Museum, Cambridge, Mass., p.10.
[70] Stephens, 307.

The clearest design of an MoH exhibit remaining in the museum's archive is a professionally drafted plan for *In Perspective* (**Figure 2.4**)[71] which opened on June 7, 1979, with Dennis Gabor's widow in attendance.[72] By this time, the MoH claimed in its press releases to have "introduced the magic of holography to over 300,000 people" (a figure that included its traveling exhibits) and that it remained "the only [museum] in the world devoted to the display of artistic holography."[73] That said, the design of *In Perspective* was not guided by primarily aesthetic goals. Seeking to situate the MoH within the scientific history of holography, *In Perspective* was planned as a new permanent exhibit at the museum. A publicity document titled "Report on the Permanent Historic Exhibition" describes it as two exhibits in one, in which

> the outer exhibition modules trace, with a time line, the development of the medium. The inner set of displays shows each type of hologram and possibility for image formation. Together they teach the viewer what holography is, what kind of images it can produce and why, and when the significant developments in the growth of the medium occured [sic].[74]

The exhibit design plan shows a spacious rectangular loft space, the entire perimeter of which has been altered so that the flat walls feature Masonite panels at jagged 45-degree angles. In addition, the center of the space is occupied by an additional construct at similarly aligned angles. Spectators enter just past a "Book Shop Space," pass along a graphic "Introduction Wall." From there, the outer exhibit proceeds counterclockwise around the room, with a marked

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[71] Printed architectural rendering of gallery design, Structural Display Company Inc., dated Feb. 8, 1979, Exhibit: *In Perspective* (first opened June 7, 1979 at MoH; reinstalled and traveled repeatedly), Box 34, File "Reinstallation 1060," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[72] Press release titled "Historical Perspective Gained at Museum of Holography," June 8, 1979, Exhibit: *In Perspective* (first opened June 7, 1979 at MoH; reinstalled and traveled repeatedly), Box 34, File "Catalog 1059," Museum of Holography archives, MIT Museum, Cambridge, Mass., p.2

[73] Ibid., p.1.

[74] Typescript copy of "Report on the Permanent Historic Exhibition" (title used on subsequent page headers), undated, Exhibit: *In Perspective* (first opened June 7, 1979 at MoH; reinstalled and traveled repeatedly), Box 34, File "Catalog 1059," Museum of Holography archives, MIT Museum, Cambridge, Mass., p.1

"Beginning" point. The linear progression past these panels narrates the history of holography from Gabor's published ideas in 1949 and concluding, on the opposite side of the room, in 1976 with the founding of the MoH and a panel marked "What the future holds, title (Tomorrow)."[75] Each narrow, vertical panel was identical, with a circular feature at average adult height containing the hologram or explanatory text.[76] The first hologram that visitors would see in this section was the *Portrait of Dr. Dennis Gabor*, created on the occasion of him winning the Nobel Prize.[77] An excellent example of the form, this striking, clear hologram shows Gabor seated behind a desk. His pen is in hand over a piece of paper, though he's looking forward at what in a photograph would be the camera lens but in this case was a pulse laser.[78] Nonetheless, he's now looking directly at the MoH spectator — at least, he is when that spectator is standing directly in front of the hologram. When the spectator moves to either side, particularly as they begin to move into the exhibit, Gabor's gaze is averted. The dimensionality of the image (despite its single red coloring), its fairly large size, and the realism of its reproduction easily creates the effect of a window, through which was not the museum wall but Gabor himself, in red darkroom lighting, seated and staring at the spectator. The choice of this hologram as the exhibit's prefatory image situated Gabor as a kind of holographic Rod Serling, inviting spectators to visit a new zone of experience.

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[75] Printed architectural rendering of gallery design, Structural Display Company Inc., dated Feb. 8, 1979, Exhibit: *In Perspective* (first opened June 7, 1979 at MoH; reinstalled and traveled repeatedly), Box 34, File "Reinstallation 1060," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[76] Printed architectural rendering of design for display panels, Structural Display Company Inc., dated Feb. 8, 1979, Exhibit: *In Perspective* (first opened June 7, 1979 at MoH; reinstalled and traveled repeatedly), Box 34, File "Reinstallation 1060," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[77] Conductron Corporation, G. Robert Schinella, McDonnell Douglas Electronics Corporation, *Portrait of Dr. Dennis* Gabor, 1971, 18-by-24 in., Museum of Holography archives, MIT Museum, Cambridge, Mass.

[78] A photograph on the Nobel Prize website (https://www.nobelprize.org/prizes/themes/lippmanns-and-gabors-revolutionary-approach-to-imaging) shows the holographic imaging equipment arranged around Gabor at his desk for the 1971 portrait.

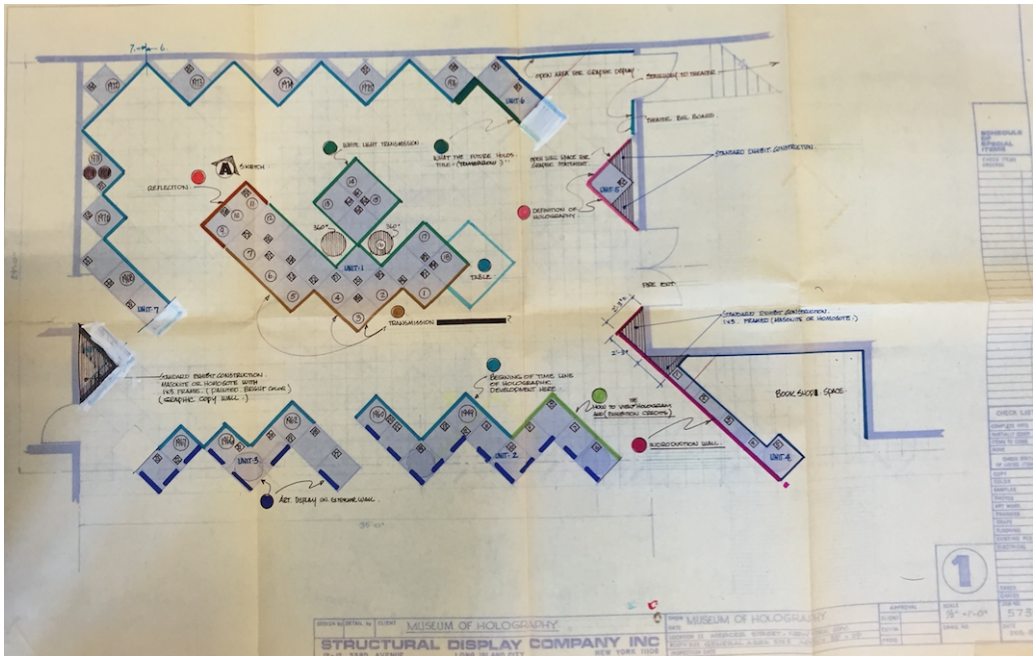

Figure 2.4. The exhibit design plan for *In Perspectives* at the MoH[79] shows a spacious rectangular loft space in which the entire perimeter repeats the jagged surfacing of the single wall from *Similar Visions* in Fig. 2.3. This outer display ring is meant to be viewed in a clockwise path on this diagram so that spectators may read its linear historical narrative of holography as a technical science. The interior islands of 3D displays, however, may be accessed in any direction or order, freeing the viewing subject to write their own exploration of the images.

But while this portion of the exhibit began with a scientist, it ended with the goddess of beauty. After Gabor's sober portrait, the MoH spectator was guided by examples of the imagery's technical progress and evolving forms, including milestone experimental holograms created by holographers in America, Europe, and the Soviet Union (e.g., pioneers such as Leith & Upatnieks, Y.N. Denisyuk, Tung H. Jeong, Stephen Benton). Midway through the sequence were several exhibited publications, presented as notable emergences of the image form into popular culture (a 1965 issue of *Scientific American* containing the first article about holography, a 1967 *Science Yearbook* containing "the first bound-in-the-book hologram"). This marks a

[79] Printed architectural rendering of gallery design, Structural Display Company Inc., dated Feb. 8, 1979, Exhibit: *In Perspective* (first opened June 7, 1979 at MoH; reinstalled and traveled repeatedly), Box 34, File "Reinstallation 1060," Museum of Holography archives, MIT Museum, Cambridge, Mass.

transition in the narrative from holograms as objects of science to objects of art. The second half begins with an 8-by-10 transmission hologram by Bruce Nauman, "the first major artist to become involved with the medium." This is followed by panels depicting holography's early marketing experiments (a King Vitamin cereal box), emerging animated forms (stereograms and holographic movies), and holograms created with specific aesthetic intent. Memorabilia from the MoH opening was shown before the final image, *The Bartlett Head (Aphrodite)*, on loan from the Boston Museum of Fine Arts.[80] The exhibit card worshipped her scientific achievements ("the newest example of white-light holography") and aesthetic value ("the last word for 1979 for the state of this art").[81] The aesthetic value on display, though, was merely a visual translation of a physical sculpture from Greek antiquity into the "light sculpture" of holography — a mechanical reproduction of the Aphrodite head without alteration or notable artistic intervention, save perhaps the selection of a viewing angle for the piece (slightly from above her forehead, with the goddess' face fully visible once the spectator moves to the right) and the literal framing of that view. This hologram was a new-media copy, not a new-fangled creation — precisely the realism that painted a critical target on aesthetic holography from the beginning.

The section of the exhibit in the center of the room was arranged differently and designed for a freer, less narrative flow. Rather than a linear, textual arrangement, this varied construction is divided by a typology of 18 displayed holographic images: seven transmission holograms, three reflection holograms, six white-light transmission holograms, and two stereograms. Each hologram was 12-by-12 inches (except one playing-card sized hologram, and the two stereograms), and each had been commissioned especially for this exhibit. They each depicted

[80] This achromatic rainbow hologram by Stephen A. Benton, Herbert S. Mingace Jr., and William R. Houde-Walter shows the detached head of a statue of what is believed to be Aphrodite, an antiquity titled *Head of Aphrodite* (*The Bartlett Head)* that is still a centerpiece of the Bartlett Collection at the Boston MFA.
[81] Typescript copy of "Report on the Permanent Historic Exhibition," p.2.

the same image: a still-life grouping of three apples. This conceit was chosen "so the viewer can easily see how different processes and techniques change the color or position of the image."[82] Thus, regardless of which direction the spectator revolved around the exhibit center, they would experience the same image in a variety of forms — real (in front of the plate) and virtual (behind the plate), pseudoscopic (inside out and backwards) and orthoscopic (correct and right-side up), apples on surfaces, apples floating in mid-air, apples in red and green and rainbow stripes (colors determined not by natural pigment but by hologram type). A multi-channel hologram showed three different exposures of the apples in one plate, so that as the spectator moved from left to right before the image it changed from three whole apples to three apples with an increasing number of bites taken out of them. (This, of course, allowed for spectators to run the animation in reverse by moving from right to left, magically restoring eaten apples to newly picked ones.) The two stereograms — multi-channel hologram strips placed onto illuminated rotating turntables — depicted the three apples and a hand removing one (the limit of the 120-degree length), then the hand returning it with a bite taken out (a full 360-degree length). One of the transmission holograms was displayed intentionally broken into two pieces, so that spectators could view another property of optical holograms: each piece of a hologram contains and displays the entire image. Nearest the exhibit entrance was a holographic imaging table, the kind of vibration-isolating work surface used by holographers to set up the lasers, lenses, mirrors, plates, and subjects for the creation of basic holograms of objects. This table featured an actual apple within the imaging array, along with a completed hologram of that apple.

In this exhibit design — specifically in its transition afforded from a rigidly linear flow along the outside into the more open center, where the viewing subject is granted more freedom

[82] Ibid., p.3.

to select a path and move through the space — one can see manifested the museum's discourses about holography as a less discursive, more dialogic communication code. In the separation between the ordered chronology of holography's historical narrative and the subsequent physical encounters with various holograms, the *In Perspectives* show segregated the scientific, technical aspects of the medium from the aesthetic experience of the image form. The linear history, in fact, led spectators in that specific direction: from technical origins toward artistic fulfillment. (Flusser's technical image category is explained similarly, as a movement from the linear histories of written text and the cause-effect order of scientific knowledge toward a newer image code from which meanings may be "seized at a glance."[83]) That the MoH organizers surrendered themselves to this epistemic trajectory and tried to bring their visitors along for the ride is significant in that it reverses the Polytechnic's attempt to fuse linear and spatial codes a century earlier as the technical image was first emerging. John Henry Pepper tried to have his cake and eat it by dazzling spectators with a new kind of image in his ghost illusion and then taming it with his own scientific explanation (as Flusser says is the purpose of all text). At the MoH, artists and organizers seemed to recognize that they couldn't yet abandon technical explanations *of* the imagery completely, but they instead worked to foreground spectators' experience *with* the imagery. Where Pepper at the Polytechnic astounded before explaining, the MoH explained as *preparation for* astoundment. It's not that an MoH exhibit offered a purely subjective experience; viewing subjects still were directed carefully toward a particular physical and ideological position, but once delivered to the threshold of this new experience, spectators had considerably greater freedom to explore its space and map out their own meanings. Key to that freedom, as discussed in the next section, was both granting spectators the assurance that

[83] Vilém Flusser, *Towards a Philosophy of Photography* (Göttingen, West Germany: European Photography, 1984), 6.

movement in these spaces was indeed allowed, if not required, and then instructing them on how to do so as new holosubjects.

'How to look at a hologram': Instructions for a new viewing body

Spectators new to hologram viewing struggled to "find" the imagery and experience the art. Holographer Stephen Benton said that spectators seeing holograms for the first time experience them through "a kind of startled disbelief. Watch them pause and stare, and then look around again, daring the space behind to reveal itself again, and then rock from side to side to see if it's all there at once, testing their own comprehension of something they had not expected to see."[84] One reviewer of a MoH exhibit noted that viewers of holograms often looked "foolish" as "tall adults have to stoop and little children have to leap in order to get the angle of light right."[85] When the MoH's inaugural exhibit traveled abroad, the same thing was reported in a humorous context; in a letter to the MoH from an official at the Israel Museum in Jerusalem, he says "the funniest [sight] is to see adults climbing on the podiums and then bending down to be able to see the holograms at the proper angle."[86] Funny and foolish, however, was not necessarily how the MoH wished its spectators to feel. As Jackson and Benton each observe, the process of moving the body can seem unnatural, particularly after a lifetime of conditioning to stand still in the control position of traditional spectatorship. Thus, from the outset, the MoH incorporated

[84] Typescript draft of exhibit catalog text, "Now You Can Look Around It" by Stephen Benton, dated Jan. 22, 1980, Exhibit: *Similar Visions* (March 21-May 18, 1980), Box 34, File "Catalog 1123," Museum of Holography archives, MIT Museum, Cambridge, Mass., p.46.

[85] News clipping of exhibit review, "At the Geographic, Life, Death, and Laser Art" by Henry Allen, *The Washington Post*, June 16, 1989, Exhibit: *As We See It: Exploring the World through Holography* (ran at the MoH Dec. 1, 1978-Feb. 25, 1979; later traveled), Box 32, File "Clippings," Museum of Holography archives, MIT Museum, Cambridge, Mass., p.B1.

[86] Correspondence from Nissan (no last name given) at the Israel Museum in Jerusalem to Paul Barefoot of the MoH, Aug. 4, 1980, Exhibit: *Through the Looking Glass* (Dec. 8, 1976-Feb. 27, 1977), Box 37, File "Correspondence, Forms 1157," Museum of Holography archives, MIT Museum, Cambridge, Mass.

different forms of discursive material throughout its galleries that might guide spectators toward a successful spotting of the hologram. The *In Perspective* exhibit, for instance, contained a great deal of text, both as exhibit cards and as graphic walls that featured explanatory narratives and viewing instructions, such as "Definition of Holography" and, nearest the entrance, "How to View the Hologram"; its imaging table was accompanied by text explaining the functions and positioning of the equipment on display, as well as how spectators should position themselves in order to see the results of that technical production process. Such instructions — in the form of written how-to's, diagrams, and movement directions — were a trademark of MoH exhibits, and they appeared in a variety of forms (printed in programs, displayed in the galleries, recorded in audio guides, etc.) designed to direct the movement of spectators' bodies through the galleries but also around the holograms. Exhibit design at the MoH rarely left spectators to the chance discovery of a hologram image's unique aspects. "We have to remember that people who come here are not familiar with holography," Jackson says in a 1976 newspaper interview, mentioning her initial thoughts about how to construct and arrange a space that is conducive to dancing with spectral images. "We're going to put up numbers indicating the best places to stand, because people don't understand it." The MoH saw as its mission not just the display of art and creation of spaces for aesthetic experience but the education of spectators to this particular type of technical imagery.

One diagram, in particular, was developed in the MoH's first year and displayed repeatedly for at least a decade in its galleries, usually near an entrance, as well as being printed in guides and catalogs. The hand-drawn image (**Figure 2.5**) shows three normative types of human spectator examining a hologram hanging on a wall: a child standing on a stool, an adult couple standing on the floor, and a taller adult man standing next to them and bending slightly

forward. The diagram, titled "How to Look at a Hologram," appeared at *Through the Looking Glass*, the MoH's first exhibit in its own gallery (and which traveled widely around the country),[87] and exists in the files for exhibits as late as *The Holographic Instant: Pulsed Laser Holograms* in 1987.[88] The diagram positions the holosubject and suggests correct ways of looking at holograms based on differing categories of human bodies. Visitors to the MoH frequently were referred to this diagram and to written viewing instructions ("Be sure to read the viewing instructions on the north wall next to the bookstore"[89]).

[87] Photocopy of line drawing, "How to Look at a Hologram," undated, Exhibit: *Through the Looking Glass* (Dec. 8, 1976-Feb. 27, 1977), Box 37, File "File 1143," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[88] Photocopy of line drawing, "How to Look at a Hologram," undated, Exhibit: *The Holographic Instant: Pulsed Laser Holograms* (May 15-Oct. 16, 1987), Box 32, File "1016," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[89] Typescript draft of "Study Notes to *Light Years*," undated, Exhibit: *Light Years* (June 9-Aug. 27, 1978), Box 34, File "1072," Museum of Holography archives, MIT Museum, Cambridge, Mass., p.1.

Figure 2.5. This hand-drawn image, titled "How to Look at a Hologram,"[90] appeared in both gallery spaces and exhibit publications throughout the majority of the MoH lifespan. It depicts three categories of bodies (a short young child, a taller adult, and an older couple) and suggests how each might achieve an equilibrium of viewing angle (raising himself up, standing relatively normally, or stooping forward, respectively) in order to "properly" view a hologram on a wall.

In addition, numerous written instructions appeared in galleries and programs. These pedagogical texts offered a clear didacticism for naturalizing the mobile experience of viewing holograms. This one from a draft of study notes accompanying a 1979 exhibit echoes and extends the imagery from the fig. 5 diagram:

> Holograms are a lot like eye glasses — you can't see a thing if you don't look through them the right way. Just remember that your eye level should be aimed at the center of the plate, and that the best general viewing distance from most holograms is at least arm's length. Of course, you will want to bob up and down

[90] Photocopy of line drawing, "How to Look at a Hologram," undated, Exhibit: *The Holographic Instant: Pulsed Laser Holograms* (May 15-Oct. 16, 1987), Box 32, File "1016," Museum of Holography archives, MIT Museum, Cambridge, Mass.

> and move from side to side to experience the full range of imagery and parallax available in a hologram. But keep in mind that tall people and small children will need to adjust their height (by bending down or standing on a milk carton available up by the front door for this purpose) to see the images.[91]

Often these instructions were general for all holograms, but sometimes they were specific to individual pieces. In Sam Moree's 1982 *Flux* exhibit, the text for the gallery suggests specific distances for viewing any of them (10-15 feet from the plates) with different suggestions for two specific holograms, one viewed from 5 feet and one from 2 feet.[92] In the MoH's first retrospective of its own collection, just two years after opening, a typed draft of study notes features numbered texts to accompany each piece in the exhibit, many with specific viewing instructions for how far away to stand, how to move in proximity to the images, etc. For Jeremiah Chechick's hologram *Autoportrait*, these advise, "If you look up the leg and around to the left," an extra, otherwise hidden image will be revealed. For Pam Giebels' *The Poet*: "It is best viewed from about ten inches away from the plate, where it will focus in any one color depending on your height." By the third iteration of this retrospective, individual holograms included a "Suggested viewing distance" on each nameplate in bold type.[93] Occasionally, the MoH would experiment with more inventive techniques for both controlling and educating the spectator. For instance, wall text for Schweitzer's *The Gallery Triptych* — a challenging and

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[91] Typescript draft of "Study Notes for *Light Years II*," undated, Exhibit: *Light Years II* (June 8-Sept. 9, 1979), Box 34, File "1074," Museum of Holography archives, MIT Museum, Cambridge, Mass., p.1. When I visited the MoH archive at MIT and viewed its small exhibit of holograms at the MIT Museum, I — as a tall person myself — found that I had to stoop in order to catch the holographic nature of some of the images hung on the walls. When I asked whether this posed a display challenge, my guide said the museum had experimented with different display heights and structures, determining that hanging frames at a determined average height made it somehow easier for spectators to instinctively stoop (if they were tall) or stand on tip-toes (if they were short). Stools and ladders — as indicated in the MoH diagram — were options, he said, but these were deemed a safety hazard on the floor of a public gallery. I do not know whether the MoH actually provided stools in its galleries.

[92] Typescript draft of viewing instructions for gallery placard, undated, Exhibit: *Flux, A Sam Moree Exhibit* (Feb. 12-May 9, 1982), Box 32, Museum of Holography archives, MIT Museum, Cambridge, Mass.

[93] Photocopy of gallery placards, undated, Exhibit: *Light Years III* (Dec. 11, 1980-Nov. 29, 1981), Box 34, File "Exhibit Lists and Info 1075," Museum of Holography archives, MIT Museum, Cambridge, Mass.

complex group of holograms intentionally experimenting with depth and space — contains an ingenious conceit for positioning the spectator. After mentioning metaphorical threads to be found within the holograms' imagery, the text directs the spectator to a literal one: "There are other threads to be discovered here, as well, beginning with the one hanging before you. Reach out and pull the thread. This should place you in the proper viewer location for the complete view of the panorama."[94] This simple instruction starts the spectator moving and engaging with the piece by taking hold of a piece of string hanging underneath the hologram and using its length to position the themselves at a point of discovery determined by the artist.

Despite the seemingly obvious presence of the dimensional image, the MoH's discursive texts often deploy figurative language referring to a more embodied mode of viewing holograms. One of the most frequently used metaphors for this interaction is dance. In a catalog forward to Moree's *Flux* exhibit, Jackson writes, "It is, indeed, a dance — both for the mind and the body."[95] Her use of "indeed" implies that she is responding to another text in that exhibit's catalog: a complex and poetic set of viewing instructions written by historian of science and mathematician Bob de Marrais. "A hologram, properly viewed," he says, "is an excuse for Tai Chi, requiring you to bob up and down, weave left and right, each artwork having its own implicit set (or sets) of 'Arthur Murray footprints.'"[96] He proceeds to write out a step-by-step guide to viewing a couple of Moree holograms, instructing the spectator to "hunch down," "come nearer" and "move still closer," all the while reporting what in the image should reveal itself as the result of each contortion — you'll "catch color," a "violet-blue-bathed sunrise opens

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[94] Preprint copy of exhibit catalog text, "The Gallery: Triptych," undated, Artist files, Box 31, Folder "Schweitzer, Dan #882," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[95] Printed exhibit catalog, "Foreword" by Rosemary H. Jackson, Exhibit: *Flux, A Sam Moree Exhibit* (Feb. 12-May 9, 1982), Box 32, Museum of Holography archives, MIT Museum, Cambridge, Mass., p.4.

[96] Arthur Murray was a popular American ballroom dancer in the early 20th century who later operated a chain of dance studios across the country. This included a widely recognized series of mail-order diagrams showing directed footprints, which users would place on the floor to guide them through various dance steps.

up," watching for embedded images that "rise up like vapors from jungle clearings" and begin "making your eyes pop." He stresses that the experience is not just about moving one's body through space on the plane of the floor, the spectator must also move up and down, twist and bend, on all axes. As he describes an experience with a hologram titled *Walking Feet*, he doubles down on the Arthur Murray allusion and expands it, adding that the dance steps required for hologram viewing are "not much different from those, say, you'd use to notate Chubby Checker's 'limbo dance' done backwards."[97] The metaphor must have been potent in that moment at MoH: Moree himself sketched a diagram for the exhibit suggesting how a spectator might twist and cha-cha in order to see varying levels of color and imagery within his holograms (see **Figure 2.6**). Arrows show directions for a turning head, swiveling hips, feet moving forward and sideways — the depicted footsteps looking very much like a dance-step diagram — and angles of the viewing plane suggest certain concentrations of the color spectrum.

[97] Typescript draft of text for exhibit catalog, "A Do-It-Yourself Kit for Hologram Watchers" by Bob de Marrais, Exhibit: *Flux, A Sam Moree Exhibit* (Feb. 12-May 9, 1982), Box 32, Museum of Holography archives, MIT Museum, Cambridge, Mass.

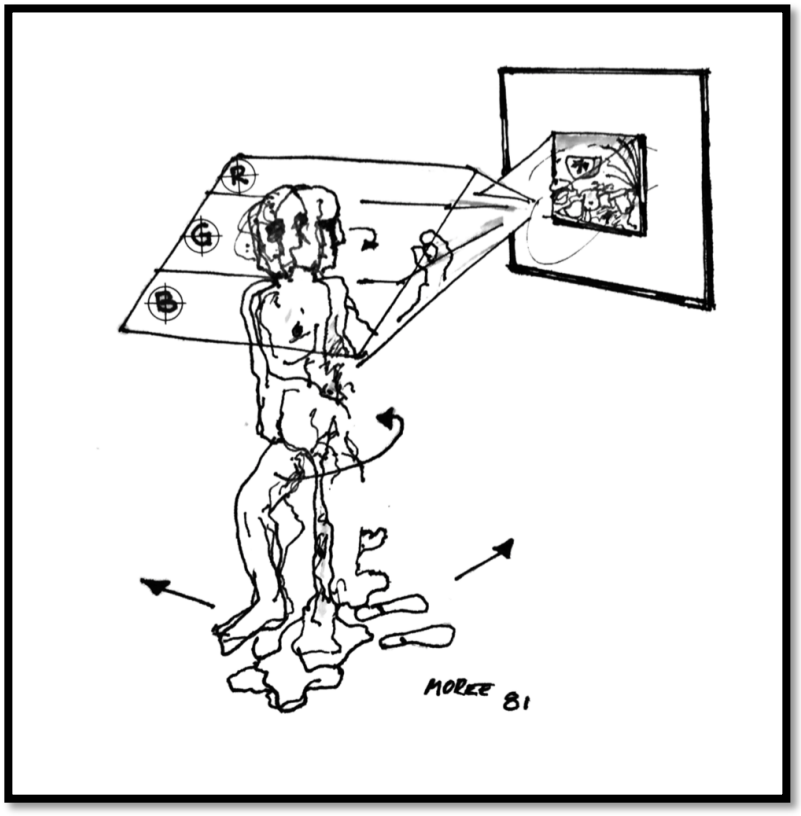

Figure 2.6. A sketch by holographer Sam Moree to accompany viewing instructions in his exhibit,[98] *Flux*, at the Museum of Holography from Feb. 12 to May 9, 1982. The sketch suggests several different modes of movement for the holosubject to find and view the various features within this particular hologram.[99] The spectator may swivel the head left to right, swivel the entire body from right to left, step forward and/or to the left, and move the head or crouch the body in order to view the image from the three angles suggested by the prism, each one displaying a different color within the scene.

Given the prevalence at the MoH of discourse about freeing spectators from pre-determined viewing positions and the practices of constructing spaces in which viewing subjects could fashion their own, more dialogic experiences, the preceding examples of didactic viewing

[98] Hand-drawn sketch of hologram viewer, untitled by Sam Moree, Exhibit: *Flux, A Sam Moree Exhibit* (Feb. 12-May 9, 1982), Box 32, Museum of Holography archives, MIT Museum, Cambridge, Mass.

[99] Judging by my own comparison of the forms within the frame depicted in this sketch with Moree's body of work, I believe the hologram shown here is *Gaugin's Eyepiece* (1980). See http://cinemavii.com/SamMoree/galleryII.html.

instructions and fairly controlled exhibit design may seem contradictory. That is, if the holosubject is indeed a free body, why was the MoH consistently seeking to control its positioning and perspective? These efforts, however, were seen as conventional means to a revolutionary end — leading the viewing subject through a familiar experience in order to introduce them to both the end of that experience and the beginning of a new one. We can surmise that this general practice on behalf of MoH artists and organizers was based on their own viewing and creative experiences with holograms — their own learning curve in figuring out this new image-spectator relationship. MoH artists usually describe their own entrance into holography in terms of discovery — from the visual aesthetic (Dieter Jung being "fascinated by the discovery that in the make-up of the picture two systems penetrate one another — the structural and the compositional"[100]) to the philosophical (Dan Schweitzer: "I discovered that I had ignored my eyes and the vision they saw"[101]) — and MoH organizers sought to frame the wayfinding for novice spectators with similar rhetoric. Exhibit memos mention things like "Educational Points: Acquainting viewer with holograms" and, under headings marked "Discovery," statements of purpose for the entire display are also to "acquaint viewer … to develop an intuitive feel."[102] Acquaintance is a gentler experience than instruction, and intuition is ineffable compared with rational knowledge. The viewing instructions at MoH thus were more suggestive than commanding — nudging spectators toward an end result that was not yet fixed

[100] Printed catalog to *DIETER JUNG/installations* exhibit in Tokyo, "Introduction of the Artist" by Eberhard Roters, February 1986, Artist files, Box 29, Folder "Jung, Dieter #764 1 of 2," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[101] Photocopy of article published in *Holosphere* magazine, "A Conversation With Dan Schweitzer" by E.A. Bush, Jan. 1981, Artist files, Box 31, Folder "Schweitzer, Dan #882," Museum of Holography archives, MIT Museum, Cambridge, Mass.
[102] Typescript of internal memo, "Revision Report (Outline)," Jan. 30, 1987, Exhibit: *In Perspective*, Box 34, File "Catalog 1059," Museum of Holography archives, MIT Museum, Cambridge, Mass.

or materialized, as it were. The discovery of position was not an endpoint of control for the MoH but a starting point for liberation of the spectator.

Perhaps reflective of the imagery's scientific roots, MoH artists throughout the museum's archive regularly discuss the production of holograms in terms of experiments. Moree, in an edited draft of his artist's statement for one of the MoH's traveling exhibits, describes the sometimes tedious and testing process of perfecting a hologram through numerous iterations as "an experiment that can seem to contradict previous knowledge."[103] Artist Rudie Berkhout, in a draft of catalog text for a 1979 show, echoes that "most of my knowledge has come from trial-and-error experimentation."[104] Stephens often referred to her own holograms as "experiments,"[105] and her art was described by David Schaff of the National Academy of Sciences in the program of her MoH retrospective as the culmination of "a decade of experiment with new technologies and imageries."[106] MoH organizers sought to transfer this experimental perspective to the holosubject, as well. While the museum's instructions directed spectators to a certain physical place in order to discover the particular space of a hologram, MoH artists and organizers did not seek to objectify their own subjective suggestions. de Marrais's instructions for the Moree exhibit encourage spectators to "[m]ove around, experimenting with how you see" but, in so doing, to "[t]ry seeing … from 'proper' angles" — his quotation marks communicating a mistrust or even disdain for any objective claim on any sanctioned method of viewing

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[103] Typescript draft of artist statement by Sam Moree, Exhibit: *As We See It: Exploring the World through Holography* (ran at the MoH Dec. 1, 1978-Feb. 25, 1979; later traveled), Box 32, File "Clippings," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[104] Typescript and partially redacted draft of exhibit text, "Lightrecords" by Rudie Berkhout, Jan. 15, 1979, Exhibit: *Future Memories* (Sept. 14-Dec. 2, 1979), Box 33, Museum of Holography archives, MIT Museum, Cambridge, Mass.

[105] News clipping, "Sculpting With Light Is Holographer's Art" by Nancy Gilson, *The Oklahoma Journal* (Okla. City, Okla.), Aug. 25, 1978, Artist Files, Box 31, Folder: "Stephens, Anait #904 1 of 2," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[106] Printed exhibit catalog, "Notes on Anaït's Sculpture" by David Schaff, Exhibit: *Paradigms Lost* (April 6-June 3, 1979), Box 32, File "Anait Retrospective," Museum of Holography archives, MIT Museum, Cambridge, Mass.

holograms — before finally "getting pleasantly disoriented." He concludes: "Work out your own dance to fit your own reading."[107] The experience of viewing a hologram should wind up being as experimental as its production.

The text accompanying the original MoH gallery diagram above (Fig. 2.5) also frames the experience this way — as a subjective experiment but also one resulting in a more embodied interaction — concluding:

> But remember, one of the fascinating things about holograms is that they look different from every angle and distance. So experiment. By approaching the work at different angles and heights, you will see different views, changing perspectives and spatial relationships, and sometimes shifting colors. This is all part of the excitement of the viewing experience. In order to enjoy and fully experience the dimensionality, we encourage you to bob up and down and move from side to side. Look from a distance. Then examine closely. And by all means, reach out and touch them.[108]

The gesture of holopresence and its 'hallucinatory power'

The call for the spectator to make this extra sensory attempt — the very suggestion that the spectral, projected image not only *could* be touched but may actually be *hailing* the spectator to try — is the defining paradox of MoH discourse about holograms. This potential mixing and integration of matter and specter was made clear at the MoH from the start, laid out artfully in a revolutionary manifesto written by the museum's founding director Rosemary Jackson for the catalog of the museum's inaugural exhibit, *Through the Looking Glass* (the title alluding to Lewis Carroll's own ideas about frames being not so much representative surfaces as portals into new and wondrous kinds of spaces and experiences). Jackson's essay is a text as bold as any she

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[107] "A Do-It-Yourself Kit for Hologram Watchers" by Bob de Marrais.

[108] Photocopy of exhibit program, "How to look at a hologram," Exhibit: *As We See It: Exploring the World through Holography* (Dec. 1, 1978-Feb. 25, 1979), Box 32, Clippings file, Museum of Holography archives, MIT Museum, Cambridge, Mass.

would write in the eight years she helmed and shaped the institution (1976-1983). Titled "Enter Holography (An Announcement and an Invitation)," her text extends its titular metaphor in order to lay out what would remain hallmarks of MoH discourse about the radical novelty of optical holography. The essay pulls no punches with its opening salvo: "Holography is perhaps the most revolutionary visual recording medium since the prehistoric cave paintings at Lascaux."[109] Texts throughout the same exhibit began transmitting the particular discourses that would come to define and guide the MoH, announcing holography as nothing less than a bold and radical arrival not only to aesthetics but to human communication overall. She continues, "For the first time in the history of literate man, we can communicate through a medium which has the same dimensional properties and characteristics as the world in which we live."[110] Again, if physical dimension were the only crux of Jackson's claims about holography's novelty, this would hardly support a cultural revolution; what she claims could also be said of sculpture. The novelty of three-dimensional, volumetric imagery justified spectator curiosity, but not necessarily a paradigm shift in thinking. Jackson repeatedly declares a hologram's three-dimensional imagery to be a cultural progression beyond what she considers the *mere* two dimensions of a painting. Literally, yes, holograms add an actual extra dimension to imagery. Spatially, they are more than traditional 2D images but are not wholly solid 3D objects; as such, they potentially possess and convey more information about their antecedent subject than flat, screened imagery. But it's precisely that liminal aspect — the hologram's failure to become fully material, or to be touched — that opens it up as a site of spectral spectator experience. The hologram's lack of solidity

[109] Exhibit catalog essay, "Enter Holography (An Announcement and an Invitation)" by Rosemary H. Jackson, Exhibit: *Through the Looking Glass* (Dec. 8, 1976-Feb. 27, 1977), Box 37, File 1143, Museum of Holography archives, MIT Museum, Cambridge, Mass.
[110] Ibid., 5.

denies a grasping, meaning-making hand, but it also affords the MoH spectator ways to explore, experience, and play with subject positionings unavailable to traditional imagery.

Jackson's double-entendre title is key: she's announcing the arrival of not only holography but the aesthetic uses of it displayed by the museum (holography is entering the art scene, as it were), and she also is announcing the imagery's radical novelty (here's an image form a viewing subject might *actually* enter) and is inviting willing subjects to do so at her museum. Whereas Pepper at the Polytechnic maintained performative distance between his depiction of holosubject interactions on stage and his audiences of holosubjects-in-training, the MoH introduced itself as a site of encounter with this new image form, a place where existing viewing subjects could try on the role of the holosubject through direct experience with holograms. Jackson's essay meant to send up a flare, announcing (per her title) the arrival of new experiences to be explored and inhabited by embodied, mobile viewing subjects. The physical participation of this new subject (as facilitated by the MoH exhibit designs and their viewing instructions) would *start* them on a journey into a unique mixed reality of natural and technical spaces, which in itself would nurture and even require new ways of thinking and communicating. Once thus engaged, the MoH spectator would think differently about their relationship with mediated imagery and perhaps accept that subjective movement, repositioning, and a multiplicity of perspectives was instrumental to technically mediated communication.

Instructive calls in MoH texts and galleries to "reach out and touch" were meant to activate more of the viewing subject's body in the experience of these radical visuals. The point of such discourse was not so much to initiate the reaching out but just to assure spectators that such participation was OK. Museum texts and especially news-media reporting of hologram exhibits are pervaded by descriptions of spectators routinely reaching out toward a projected real

hologram (finding only air) or into the projected space of a virtual one (knocking hands against the framed plate). One newspaper reporter marveled early on that a hologram "is so mystifying, viewers will be tempted to reach out and touch it. Museums consider fingerprints on the glass-covered pieces a sign that the show is being appreciated, but viewers are asked to touch gently."[111] The language of temptation in such discourse frames the embodied act of the reach as an essential, instinctual human response — a haptic attempt to verify the solidity or spectrality of the imaged object. Later versions of the text accompanying fig. 5 omit the final line encouraging spectators to attempt to touch the holograms[112] (perhaps there were issues or damage after years of this physical interaction); plus, notably, that same diagram does *not* depict its model spectators reaching out toward the holograms they are viewing. Elsewhere, though, the MoH roundly encouraged this gesture. Study notes for the MoH's first retrospective of its collection, for instance, explain that, in Rick Silberman's *Ball and Jacks*, "The projected ball is most dramatically in evidence if one moves from side to side and tries to touch it."[113] These texts pushed spectators toward the extra sensory practice, often framing it as knowledge production: "Feel free to touch. It is part of the learning experience to see your hand go through the images and be able to understand that they float in space."[114] Either way, the attempt to touch a hologram added interest to the spectacle of their exhibit — even when that attempt would

[111] Newspaper clipping, "Weird and wonderful holograms" by Susan Barbosa, *The Ledger*, May 15, 1980, Exhibit: *Through the Looking Glass* (Dec. 8, 1976-Feb. 27, 1977), Box 37, File: Traveling Show News Clippings 1155, Museum of Holography archives, MIT Museum, Cambridge, Mass.
[112] Photocopy of diagram, "How to look at a hologram," Exhibit: *The Holographic Instant: Pulsed Laser Holograms* (May 15-Oct. 16, 1987), Box 33, Museum of Holography archives, MIT Museum, Cambridge, Mass.
[113] Typescript draft, "Study notes," pp. 3-4, Exhibit: *Light Years* (June 9-Aug. 27, 1978), Box 34, File 1072, Museum of Holography archives, MIT Museum, Cambridge, Mass.
[114] Ibid., 4.

inevitably fail. Johnston describes mesmerized viewers of early scientific holograms: "The action of seeking, and failing to touch, this ghost-like apparition retained the interest of viewers."[115]

The holosubject's reach is symbolic of what Flusser might have called the gesture of holography. At the time of his death in 1991, Flusser had nearly completed a thorough theory of gesture, encapsulated in a collection of essays, *Gestures*, which contains 16 phenomenological descriptions of a wide range of fundamental human activities: many of them related to media, such as writing, filming, videotaping, and photographing, as well as pipe smoking, shaving, telephoning, listening to music, planting, even, simply, a gesture of "doing." For Flusser, a gesture is "a movement of the body or of a tool connected to the body for which there is no satisfactory causal explanation."[116] This movement is symbolic of "states of mind"; "it represents something, because it is concerned with a meaning."[117] Involuntary bodily movements, such as squinting in bright light, are not gestures. The gesture materializes abstract thinking and "expresses a freedom."[118] Spurred on largely by Husserlian phenomenology, Flusser's gesture is a projection of a specific intention. In "The Gesture of Making," Flusser suggests that a tendency toward binaries in human thinking stems from the experience of possessing two hands, so that "[t]he structure of our hands demands that the gesture of making strive for wholeness ('perfection') but also forbids ever reaching it."[119] Holograms would seem to constitute what Flusser decides to set aside from this gesture as "incomprehensible objects," those which cannot be grasped because they are impenetrable or because "what the hands are reaching through is

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[115] Johnston, *Holographic Visions: A History of New Science*, 351

[116] Vilém Flusser, *Gestures*, trans. Nancy Ann Roth (Minneapolis & London: Univ. of Minnesota Press, 2014), 2. He adds: "And I define *satisfactory* as that point in a discourse after which any further discussion is superfluous" (2).

[117] Ibid., 4.

[118] Ibid., 163.

[119] Ibid., 33.

only air."[120] "When this happens," he continues, "the hands perform entirely different gestures that are not within the scope of this essay. But it is advisable to remain aware that there are incomprehensible things and that our hands cannot grasp everything."[121] Within the scope of this dissertation, however, hands grasping after seemingly incomprehensible objects constitute the very gesture of holopresence — a movement of the hands for which an explanation may not be clear at all (particularly from another observer at another angle who cannot see the spectral imagery seen by the holosubject). This gesture reveals, at first, a wondrous state of mind, followed perhaps by uncanny fascination and unease as the holosubject's experience of the hologram defies the very meaning-making gesture Flusser ascribes to two-fisted humanity. When the hands may no longer grasp things in order to make the world, the holosubject must make sense of experience some other way.

The gesture of holopresence, however, is not just made with the hands. Holograms at the MoH afforded spectators opportunities to move and position their entire bodies in gestural attempts to make sense of the novel imagery. This scaling up of the embodied interaction with imagery gets at the heart of what MoH artists and organizers believed was so revolutionary about holograms. The "dancing" described above, though, only gets us so far — one may dance *before* a painting or do-si-do *around* a sculpture, but it's more difficult to say that one dances *with* these visual forms because they make different claims on boundaries between the virtual and the real. Interaction with an image that appears to exist apart from a screen (thus implying that such a boundary may not exist) — an image that presents as an object or subject, which not only may be seen from multiple viewpoints but actually hails the viewing subject to go looking for those — made the viewing experience of holograms at the MoH far different from the "static experience"

[120] Ibid., 36, 35.
[121] Ibid., 36.

offered by traditional imagery on surfaces, which display only "one fixed (given) view."[122] By contrast, Jackson writes, "Objects in holograms can be viewed from many angles and, in fact appear in changing relationship to each other when viewed from different positions."[123] As a result, a hologram has "the ability to be many different compositions at the same time,"[124] implying different "readings" to be "written" into the image by the artist as well as decoded or even created by the spectator. "One hologram can contain several different 'channels,'" she says.[125]

One of those channels is of particular importance to her claims of holography's radical novelty — a subject positioning unique to "real" holograms. Art history, from Jackson's perspective, is one of spectators outside an image looking at or into it. Imagery may suggest a viewing position from the artist's perspective or elsewhere, but this has only been accomplished ideally, not materially.[126] For Jackson, holograms offered the spectator a viewing position that is truly unique: from *within* the image. This is made possible by both the projection of the imagery into the spectator's three-dimensional space (via "real" holograms) and the spectrality of its 3D image. At first, spectators conflate both spaces, which Jackson concedes: "Holographic images exist in their own space which exists in real space (as space). It is sometimes very difficult to tell where one volume stops and the other begins."[127] But this provides the viewing subject their ultimate advantage, for with the spaces mingled and indistinct the holosubject may then physically step inside the image itself. No frame or screen separates the spectator's world from

[122] "Enter Holography," Jackson, 5.
[123] Ibid.
[124] Ibid., 6.
[125] Ibid.
[126] As I explored in my first qualifying exam at UCSD (and as noted in my Introduction), cubism constituted an attempt by makers of traditional portrait imagery to boost the spatial signal of their representations, pointing toward the later technical practices of capturing complete dimension in holography. It's not too far a stretch to suggest that a Picasso painting depicting three sides to a subject's head is striving toward the ideal of the spatial technical image.
[127] Ibid., 5.

the image world. “This unique perspective,” Jackson writes, “is like being inside the imagery looking out to where the viewer normally would be.”[128] Her use of “like” is tentative perhaps for an inaugural exhibit essay. The experience is not necessarily metaphorical; a spectator, with the right hologram, may literally step inside the imagery. As presented at the MoH, then, holograms were image forms to view but also to inhabit. MoH spectators were not asked to look into a virtual reality space but to join a mixed reality of real virtuality.

Later, Jackson is more direct about this new perspective, describing a potent moment in which she assisted a spectator in its discovery. “Two days ago,” she told a New York City newspaper late in 1976, “a man came in and looked at the black cube that is projected away from the wall. He said he didn’t see anything. I told him he was standing in it. He moved back and it came floating out.”[129] In viewing holograms for this research, I experienced something similar. Several holograms from the MoH collection were on display in 2015 at the MIT Museum, site of the MoH archive. One of them was a hologram of the Nigerian Ife Head (a noted bronze sculpture unearthed in 1938) imaged by Ana Maria Nicholson.[130] The bald head glows green and projects forward slightly in front of the hologram’s glass plane, as “real,” so that at eye level it appears to be disembodied, floating in mid-air. As I gazed at it, my museum guide remarked that if the image projected slightly further from the glass I might be able to slip my own head *inside* the hologram — to wear it as a mask. I moved my body close to the hologram (so close I, too,

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[128] Ibid., 6.

[129] Newspaper clipping, “Holography Takes Roots in SoHo In a Museum Devoted to Future” by Richard F. Shepard, *The New York Times*, Dec. 29, 1976, Exhibit: Permanent, Box 34, File: Permanent Exhibit Plans 1094, Museum of Holography archives, MIT Museum, Cambridge, Mass.

[130] White-light transmission hologram, *Ife Head* by Anna Maria Nicholson, 1977, MOH-1993.47.HOL116, film (13.5 by 12 inches), Museum of Holography archives, MIT Museum, Cambridge, Mass. This hologram was imaged from an item in the Alice M. Kaplan Collection, though the item itself is likely a replica. At the time of my own viewing of this hologram, I assumed the original item had been a wood carving, because its surface is covered with seemingly hand-hewn grooves; the original bronze item, however, also features these grooves. The MoH database at MIT makes the same assumption, describing the imaged object as “apparently a wood carving, as vertical grooves appear to run down the length of the face.”

lost sight of its image) in order to determine if I just might be able to "don" it. Here was Jackson's invitation to "Enter Holography" echoing around the collection so many years later. My own guide was continuing the work started by the MoH in the '70s to nudge spectators toward this still-fresh subject position to be occupied physically *inside* the holographic image — to see what the hologram sees.

A more complex example can be seen in one of the most challenging holograms exhibited at the MoH, a trio of image sets that upsets understandings of viewing space and subject positioning. Dan Schweitzer's *Triptych*, mentioned above ("one of my most ambitious" pieces and "a troublesome effort"[131]), is comprised of three white-light holograms displayed next to each other in 11"-by-15" panels. Each hologram contains images of objects but also of other holograms, so that the spectator sees into the *Triptych* space, then into another hologram space, and another. "At the apex of the viewing triangle, the viewer will be viewing a total of 18 holograms at one time," he writes, adding that one of the panels is so layered that the spectator is viewing "a hologram of a hologram of a hologram of a hologram of a photograph, extending the viewing depth to a meter." These are "real" images, too, extending that far into the gallery (toward the spectator) rather than through the wall. The *Triptych* marks Schweitzer's "first real foray into the viewer space," which he says he felt necessary to make holograms that truly challenged previous, traditional images and viewing norms. Upon gazing at the center panel,

> the viewer inside the gallery space gazes through the virtual veil of the holographic plate to a point hovering in the real viewer space. Is the tiny viewer in the gallery looking at that point, or is he, in fact, looking at me in mine? For me, the point represented the reference for the three panels, shedding its light into a new arena. This, of course, opened a Pandora's box of new issues to be addressed on the viewer side of the plate.[132]

[131] Dan Schweitzer, "Time Vs. Space: Making Time," in *Holographic Network* (Berlin: Wavefront Magazine, 1996)
[132] Ibid.

Schweitzer is pointing out that the technical imagery of holograms has made literal these metaphorical explanations of the experience of viewing traditional imagery. A "real" hologram may not succeed in completely severing contact or relationship to its producing plate, but it at least achieves an extension of its imagery away from the plate and into (or overlaying) the space of the MoH spectator. He's describing a Pandora's box like Foucault identified during his explication of Velasquez's *Las Meninas* painting, a traditional image that strove to act in ways more like a technical image, especially a hologram, for which potential viewing perspectives are "superimposing themselves upon one another … as we happen to occupy the same position."[133] Jonathan Crary's study of the spatial imagery of stereoscopes in the 19th century, touched upon in my Introduction, utilizes Foucault's perspective to gird his own connecting of 3D visuals to Renaissance experiments (referring to the ultimate effect as "natural magic") before quoting a crucial question from Foucault about this new viewing experience: "Which is the reality and which is the projection?"[134] Holographer Phillippe Boissonnet describes the experience as an "intertwining of perceiver and perceived" that "distances us from our commonsensical relationship with reality," adding, "The immateriality and artificiality of its appearances distance it from this world."[135] But while distanced from this world, a hologram is nonetheless present *enough* to draw the holosubject toward it, pulling them into the liminal immateriality of its mixed

[133] Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences*, 1994 ed. (New York: Vintage, 1970), 4. Indeed, Foucault's explication of Velasquez's painting is essentially holographic, citing evidence from Velasquez's teaching advice that describes the function of a painting in overt terms of a technical-image hologram: "The image should stand out from the frame" (quoted on ibid., 8.) and the painting's very reality should be both "projected and diffracted" (ibid., 15.).
[134] Ibid., 19. Quoted in Crary, 37.
[135] Philippe Boissonet, "Holography and the Imaginary Double: The Image of Body," *Leonardo* 22, no. 3/4 (1989): 375-376.

interaction space, and offering the spectator an experience of spectrality unique to this form of imagery.

New and varied perspectives on reality, the mediated "intertwining" *of* realities — the practices of the MoH worked to promote and focus these two chief discourses about hologram experiences. First, aesthetic holographers saw in holograms functional symbols of an optimistic future for less discursive, more inclusive human communication based on the emergence and intervention of new technologies. As mentioned, many MoH artists and organizers were individuals who had participated in the Western counterculture. Sean Johnston's two histories of holography plumb this connection, noting that hobbyist holography in the late '60s connected to "countercultural themes such as frugality, adaptability and self-sufficiency"[136] and linking holography hobbyists to the similar ethos of *The Whole Earth Catalog*. Fred Turner's analysis of the '60s counterculture connects similar ideals (and that same publication) to the utopianism that fueled discourse about the internet in the '90s.[137] But Turner's extended work also telescopes backward to the counterculture's own early influences,[138] claiming that countercultural values such as social tolerance and individual freedoms actually evolved from earlier discourses circulated in the Western fight against fascism, and that experimental artistic practices in the '60s (multimedia, immersive environments and non-hierarchical viewing experiences) were simply iterations of a long-standing struggle to achieve a society founded on dialogic participation and "a turn away from single-source mass media and toward multi-image, multi-sound-source media environments."[139] These systems, which he refers to as "democratic surrounds," privileged "a

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[136] Johnston, *Holograms: A Cultural History*, 123-124.
[137] Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago & London: Univ. of Chicago Press, 2006).
[138] Fred Turner, *The Democratic Surround: Multimedia and American Liberalism from World War Ii to the Psychedelic Sixties* (Chicago & London: Univ. of Chicago Press, 2013).
[139] Ibid., 3.

three-dimensional, all-encompassing experience" unique to "modern American vision"[140] (and presaging the "encompassing view" Flusser pins as a marker of the technical image and its requisite "second-degree imagination"[141]) and the liberation of spectators from fixed viewing positions. Turner only mentions holograms in passing,[142] but the postmodern worldview[143] advocated by the MoH fits squarely (cubely?) into an Aquarian-age allegory of a society that would, in the dawning episteme, become holographic itself — whole, multi-dimensional, and dialogic.

Finally, it is no coincidence that such discourse about the transformative experience of simply viewing a hologram sounds transcendental or especially psychedelic. The holosubject's very impulse or reaction of reaching out to try and touch an ephemeral being before them — the very symbolic gesture of holopresence, signifying the holosubject's successful *entrance into* holography and its mixed reality of human viewers and technical specters — is an experience that is one thing to write about soberly in a dissertation but, in the gallery, can be viscerally disorienting, destabilizing, and, frankly, mildly trippy. Even Flusser repeatedly claimed that his technical image possesses a particular "hallucinatory power."[144] This does not, however, mean that the holosubject's seeming hallucination or destabilization of experience is somehow delusional, illusory, or untrue. MoH claims about holography's revolutionary potential rest

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[140] Ibid., 221.

[141] Flusser, *Into Immaterial Culture*, 26-41.

[142] Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*, 178, in describing the experimental and overtly non-commercial projects at the burgeoning MIT Media Lab in the 1980s.

[143] Whereas lecturers at the Polytechnic (Chapter 1) seized the Pepper's Ghost illusion on behalf of their modern ideology, artists at the MoH saw in holograms an opportunity for distinctly postmodern expression, specifically given that many elements of postmodernism, particularly in the visual arts, arise "out of the spirit of an adversary avant-gardism" (Andreas Huyssen, *After the Great Divide: Modernism, Mass Culture, Postmodernism* (Bloomington: Indiana Univ. Press, 1986), viii).

[144] Vilém Flusser, *Into the Universe of Technical Images*, ed. N. Katherine Hayles, Mark Poster, and Samuel Weber, trans. Nancy Ann Roth, Electronic Mediations (Minneapolis & London: Univ. of Minnesota Press, 2011), 10, 37. He also describes the imagination required to effectively experience the technical image as "hallucinatory" (Flusser, *Into Immaterial Culture*, 18).

entirely on the belief that the spectral imagery contributes to reality and truth rather than diverting from it. As André Bazin compared photography to surrealism and claimed that the technical image was "an hallucination that is also a fact"[145] (and as the protagonist of *The Invention of Morel* insists at the start of his account: "But there are no hallucinations or imaginings here: I know these people are real—at least as real as I am"[146]), aesthetic holographers around the MoH believed that their images participated in a similar revelation of additional epistemic and ontological perspectives. While Pepper at the Polytechnic revealed a truth *behind* his imagery (and thus returned spectators to the allegedly firm ground of scientifically explained reality), MoH holographers sought to reveal the truth *of* their images — regardless of how psychedelic the experience of that messaging might seem.

Jerry Garcia, singer for the Grateful Dead, describes his experience at an acid test[147] in terms remarkably similar to an encounter with a hologram, explaining in far-out but Flusserian terms that LSD visuals were his "first exposure to formlessness. Formlessness and chaos lead to new forms. And new order. Closer to, probably, what the real order is. When you break down the old orders and the old forms and leave them broken and shattered, you suddenly find yourself a new space with new form and new order which are more like the way it is."[148] The Museum of Holography operated like an ongoing, drug-free acid test — experimenting, fine-tuning, and naturalizing the experience of technical imagery's particular hallucinatory power and attempting to lead spectators toward their particular "new form" within its "new space." Just as other such countercultural "happenings" intended to facilitate participant access to allegedly higher realms

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[145] André Bazin, *What Is Cinema?, Vol. 1*, trans. Hugh Gray (Berkeley: Univ. of California Press, 2005), 16.
[146] Adolfo Bioy Casares, *The Invention of Morel (La Invencion De Morel)*, trans. Ruth L.C. Simms (New York: New York Review, 1964/2003), 11.
[147] Acid tests were countercultural parties organized in 1965 and '66 by Ken Kesey, one purpose of which was to expose more people to LSD and its cognitively challenging new ways of seeing.
[148] Jerry Garcia, Charles Reich, and Jann Wenner, *Garcia: A Signpost to New Space* (Hachette, 2009), 101.

of consciousness and truth, artists and organizers at the MoH believed that holograms were not just intriguing visual forms but that they represented an entirely new mode of meaning making. These were not mere aesthetic objects but a novel and complex code of communication, one that would participate in the "new order" of societies based on participatory, dialogic interactions rather than directed, discursive messaging. As Schweitzer declared in a 1981 interview, "we must help people who see holography for the first time understand what it is, that it has to do with perception and reality, and we must remind people that there are many ways to look at things. I see holography as a tool for realizing an aspect of human evolution."[149] Even though the MoH spectator may not move very far within the constructed viewing spaces of its galleries, they were at least meant to feel *far out*.

[149] Photocopy of magazine page, "A Conversation with Dan Schweitzer" by E.A. Bush, *holosphere*, January 1981, p.5, Box 31, File: Schweitzer, Dan #882, Museum of Holography archives, MIT Museum, Cambridge, Mass.

Chapter 3:
Science fiction and the projection of the mythical ‘hologram’

> But there must be something in common to those two meanings. If not, why use the same word? It must be possible to extirpate that common nucleus out from those two widely different meanings.
> — *Vilém Flusser*[1]

While institutions such as the Museum of Holography were constructing spaces for the experience of actual optical holograms, further speculations about human interaction with spectral bodies were being floated in entirely different contexts. This chapter examines a conceptual transformation from hologram to “hologram” that, by the time the MoH shuttered in 1991, was well under way within a different experimental space: the narratives and visuals of science fiction. Amid scifi’s techno-driven narratives — themselves mixed realities of modern scientific superiority (legacies of discourses promoted by places such as Chapter 1’s Royal Polytechnic Institution) and groundbreaking aesthetics (as displayed by Chapter 2’s MoH) — the term hologram was lifted from actual optical holography and reapplied to a fictional and denotatively distinct type of imagery. Seemingly native to the machined environments of the genre, the technical specter easily and swiftly transformed into the digitally programmed and projected “hologram.” Speculative novels (like *The Invention of Morel*), films, and television narratives long have featured humans interacting with and often living among subjects that are technical-image projections of digital systems and artificial intelligences — nonhuman humans, who resemble actual holograms in their spatiality and spectrality but are projected and positioned

[1] Vilém Flusser, *Immaterialism* (Metaflux, 2015), 7.

quite differently — but these depictions began to proliferate from the 1970s onward.[2] Within these portrayals of human-"hologram" interaction, any uncanniness or hallucinatory power is downplayed, if not erased, so that scifi's computerized "hologram" becomes mythologized as an utterly natural figure — a socially sanctioned subject, despite its programmed production by a veiled apparatus — acting and socializing with similarly modern, mobile, media-savvy human subjects.

Instead of replaying reflected light waves from an imaged object (per an optical hologram), the scifi "hologram" begins to replay and refashion certain discourses and practices about what it means to be a material body interacting with an immaterial one, and vice versa. First, scifi narratives about "holograms" privilege one side of the binary already examined here between "real" and "virtual" holograms. My analysis in the previous chapter focused on the Museum of Holography's construction of rooms and viewing spaces primarily for the uncanny experience of "real" holograms, those that seem to project outward from the plate and to exist within the spectator's space (or to share their virtual space with the real). Science-fiction depictions of "holograms" evolve in the same direction, appearing initially in *Star Wars* as an utterly fantastic outward projection of a human figure before exploring a more overt transformation from interior virtual spaces to similarly projected "real" subjects in several *Star Trek* television series. Although much scifi has played with digital virtual spaces that may be entered ideally by humans (think *The Matrix*), this chapter concentrates on narratives of the

[2] Early in this research, I took it upon myself to begin compiling a database of every use or appearance of a "hologram" in science fiction. The effort was abandoned when it became too much. The "hologram" is now a hallmark of the vast majority of scifi visuals. From the ubiquity of "hologram" communications throughout the *Star Wars* universe and the established norms of "hologram" characters in *Star Trek* series to the iconic digital interfaces of *Minority Report* and even animated fare such as *WALL-E*, interactions with technically spectral objects and subjects are a seemingly requisite visual effect across contemporary scifi television or film.

digital "hologram" reversing course and escaping the digital diorama in order to enter and act within real spaces.

Secondly, scifi's emphasis on the "hologram's" digital production both furthers and alters ideas about the potential realism of the virtual technical image and its uses for mediated encounters. Also as discussed in the previous chapter, hologram artists at the Museum of Holography struggled to balance the essentially strict realism of the hologram — its precise replay of an existing object's or subject's dimensional features — with a desire to visualize more complex, abstract imagery. Aesthetic holographers such as Dan Schweitzer used layering techniques to stack holograms within a single image, and Anaït Stephens combined soft, geometric shapes into, as one exhibit catalog described, "simple abstractions [that] permit us closer access to the nature of the illusion being created in terms of its most essential aesthetic potential"[3]; however, the efforts to reflect material antecedents into more abstract visuals ultimately were limited. By the 1980s, however, computers were being used to generate holographic imagery, essentially programming a diffraction pattern and "printing" the holographic plate — no material intermediary required to reflect and capture its light. This opened more extreme opportunities to defy certain conventions of realism and gave aesthetic holographers "the opportunity to make three-dimensional holograms of objects that do not — and often cannot — exist in the physical world."[4] Computer-generated holograms did not come to dominate the field of optical holography (they presented their own logistical challenges, particularly given the expense and limited popular access to computers during the lifespan of the

[3] Program text by Melinda Wortz to Anaït Stephens exhibit (*Paradigms Lost*), April 6-June 3, 1979, Box 32, "Exhibit: Anait Retrospective," Museum of Holography archives, MIT Museum, Cambridge, Mass. By the end of the 1970s, MoH artists also had begun discussing this in terms of ethics. From the same program text: "Reproductions of other art objects are especially popular as holographic subjects, but the ethics of presenting an art reproduction as a surrogate experience for the original is rightly being called into question today."

[4] Draft of exhibit brochure text by S. Greenbaum, April 15, 1991, Box 33, File 1015, "Exhibit: Holograms in the Real World," Museum of Holography archives, MIT Museum, Cambridge, Mass.

MoH), but as an *idea* the transferal of the holography concept from a physical, optical process to one programmed and (ultimately) projected by computers fueled a transformation that would remake the hologram into a mythical cultural imaginary for the express purposes of materializing realistic image-objects or -subjects within existing human social relations.

In this chapter, I examine this transformation of "real" holograms into real "holograms" through a critical analysis of two influential scifi narratives in which holopresence often plays a central role: the introduction of the "hologram" representation within the first *Star Wars* film and a motif of "hologram" characters within the *Star Trek* television franchise. My critique involves analysis of visual representations of "holograms," script directions and on-screen character dialogues about "holograms," as well as cinema production and camerawork involved in situating and depicting the various subject positionings of humans and "holograms." I will analyze details from, first, two scenes introducing the "hologram" in *Star Wars*, followed by several episodes of *Star Trek* that work to move the "hologram" from a confinement in virtual spaces to free movement within real space. I am less interested in the content of the depicted imagery than I am in its placement among the social actors on view — in how and why these spectral bodies are positioned as subjects rather than objects. In this way, particularly throughout the *Star Trek* examples, digital ghosts are performed as fully present actors within human societies. Such depictions promote and circulate discourses that naturalize a cyborg ecology[5] in

[5] I will use this phrase throughout this chapter to index networks of relationships between humans and nonhumans, such as "holograms." This is dicey, though, given that the "hologram" is not always simply an object in relationship with humans *a la* Bruno Latour's door-closer ("Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer," *Social Problems* 35, no. 3 (1988)). The "hologram's" capacity for human realism and projection as communica*tor* rather than communica*tion* complicates the delineation. But I take this very fudging of classifications to embody the concept of the *cyborg* as it has been framed (Manfred E. Clynes and Nathan S. Kline, "Cyborgs and Space," *Astronautics* 14, no. 9 (1960)) and reframed (Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socio-Feminism in the Late 20th Century," in *Simians, Cyborgs and Women: The Reinvention of Nature* (New York: Routledge, 1991). The phrase "cyborg ecologies" itself is defined straightforwardly as "a way out of dualistic thinking" around this particular binary; see Stephanie Rutherford, "Cyborg Ecologies," in *Encyclopedia of Geography*, ed. Barney Warf (Thousand Oaks, Calif.: SAGE, 2010)). Clynes & Kline's original coinage of the term

which humans accept the digital specter's presence and participation despite their occasionally revealed physical limits and liminality.

Scifi stories frequently act as Holopresence 101 lessons, demonstrating interpersonal potentials for the "hologram" imaginary. I argue that these depictions of digitally projected "holograms" within science fiction have operated as a kind of thought exercise for the naturalization of social interactions with and among spatial technical imagery, as well as fortifying the spectral nature of technically mediated encounters more broadly. Scifi's "hologram" trope has worked to make the extraordinary spectacle of a digitally projected but immaterial subject appear quite ordinary. Essentially extending the Polytechnic's brief demonstrations of actors speaking with and inhabiting the same spaces as technical ghosts, these scifi narratives return the holosubject to the stage, as it were, presenting audiences with pedagogical plays about how humans and nonhumans might interact in a holographic future but also drawing on existing discourses and practices about media to depict an everyday reality that mixes the material and immaterial. The holodeck of *Star Trek*, for instance, is merely an extension of the island in *The Invention of Morel*, where the protagonist eventually reports, "I have overcome the nervous repulsion I used to feel toward the images. They do not bother me now" and, even though specters continue to walk among him, "my life has become quite normal again."[6] Human characters in *Star Trek*, like Casares' fugitive, initially marvel at the technical spectacle of "holograms" but eventually take them for granted and even serve alongside them,

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situates the cybernetic relationships between humans and nonhumans as distinctly unconscious, which points toward the naturalization function I seek to locate within the mythical "hologram," yet Haraway evolves her iconic consideration of cybernetic theory further when she later posits the idea of "making kin," an environmental perspective on human-nonhuman relationships that is about "making persons, not necessarily as individuals or as humans" (Donna Haraway, "Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin," *Environmental Humanities* 6 (2015): 161). In this way, making kin with "holograms" is about both making that image-object into a person and making the viewing subject into one that sees *itself* as spectral kin.

[6] Adolfo Bioy Casares, *The Invention of Morel (La Invencion De Morel)*, trans. Ruth L.C. Simms (New York: New York Review, 1964/2003), 78, 79.

while the "hologram" communications in *Star Wars* are depicted as being utterly humdrum, everyday encounters with the specters of absent people.

The media imagery examined in this chapter does not (usually) represent dead people; nonetheless, we will see several ways the "machine aesthetic"[7] of Western scifi provides a different channel for spiritual discourses. Both franchises deal with religion in their own ways — *Star Wars* is famously infused by the quasi-magic energy field of the Force, and *Star Trek*'s stories are consistently respectful of a variety of real and imagined devout traditions — but I am particularly interested in spiritual discourses within the narratives that are not necessarily presented as such. Alongside the more overt parallels or parodies of traditionally spiritual encounters exist similar human struggles with the spectral that are embodied within ideas about technologies, archives, and figurations such as the "hologram." What these technical imaginaries depict are not only modes *of* situated experience but processes *for* situating these experiences in which the corporeal interacts with the incorporeal. The scifi "holograms" I'm looking at are embodied, spectral beings, with whom their depicted human co-actors (and here "actor" denotes both the theatrical *and* the sociological) are seen learning to interact with, often rearranging their physical space in order to accommodate that interaction and ultimately incorporating the incorporeal into norms of social engagement. These are hauntings, once removed — depictions of human encounters with spirits, during which audiences witness holosubjects negotiating the traditionally uncanny experience of the supernatural with the spectral experience of the naturally virtual. My analysis thus seeks to surface the *becoming* of both the "hologram" subject itself — from its representative origins in *Star Wars* to its repositioning as a technological but social

[7] Dan Rubey, "*Star Wars*: Not So Long Ago, Not So Far Away," *Jump Cut: A Review of Contemporary Media*, no. 18 (1978/2005).

subject in *Star Trek* — and the particular contribution of these imaginary depictions to the ongoing emergence of the holosubject.

Mythologizing 'imaginary media' and 'connection machines'

As I refer to the scifi "hologram" as both a mythical and imaginary technology, these terms are rooted in communication theory but also, as I will show, are specific to this fictional technical image. Depictions of this particular technical imaginary function as a myth, one that seeks to naturalize the concept not only of interacting with "holograms" in a mediated encounter but of actually living among them, as common features of everyday modern experience. Scholarship about myth[8] ranges from Carl Jung's psychological exploration of internalized, universal symbology and archetypes to Roland Barthes' social critique of external, ideological signs and mediated communication.[9] The "hologram" can be seen as mythical from both perspectives — the spectral figure could be viewed historically as a kind of Jungian archetype,[10] with these technical images simply being one of the collective unconscious' latest expressions of

[8] Science fiction is often a cauldron of modern myth-making, and many scifi stories function as disguised commentaries on their own historical moment (see Vivian Sobchack, *Screening Space: The American Science Fiction Film*, 2nd ed. (New York: Ungar, 1987), as well as this intriguing, more current, and more diverse commentary: Lauren Beukes et al., "Science Fiction When the Future Is Now," *Nature*, Dec. 20 2017), though they often frame their narratives as visions of the future (and sometimes the past). *Star Wars*, for instance, attempts to have it both ways, introducing its futuristic tale of spaceships and lasers as one that happened, famously, "A long time ago …" *Star Wars* narratives have been interpreted since the first film's premiere as mythical in chiefly literary terms, most commonly read through Joseph Campbell's influential monomyth, a universalist theory of a narrative arc recurring within stories about heroic journeys throughout most human cultures (*The Hero with a Thousand Faces*, 3rd ed. (Novato, Calif.: New World Library, 1949/2008); For the original critical connection between Campbell and *Star Wars*, see Andrew Gordon, "*Star Wars*: A Myth for Our Time," *Literature/Film Quarterly* 6, no. 4 (1978)). Such temporal shifts assist the construction of a mythical frame around the narratives, which can be interpreted according to the two primary definitions of myth: as a widely held but false belief, and as a traditional story explaining a natural or a social phenomenon within a situated culture (and often involving supernatural events and beings).

[9] Carl G. Jung, *Archetypes of the Collective Unconscious*, ed. Herbert Read, et al., The Collected Works of C.G. Jung (New York: Boolingen Foundation, 1959); Roland Barthes, *Mythologies* (New York: Hill & Wang, 1957/2013).

[10] See Claudia Richter, "Carl Gustav Jung and the Ghosts," in *Ghosts – or the (Nearly) Invisible: Spectral Phenomena in Literature and the Media*, ed. Maria Fleischhack and Elmar Schenkel (Berlin & New York: Peter Lang, 2016); Aniela Jaffé, *An Archetypal Approach to Death Dreams and Ghosts* (Einsiedeln: Daimon, 1999).

it — though this chapter will focus on the latter, framing the "hologram" as a mode of mediated communication whose very spectral form conveys a particular connotative meaning. The uncanny spectrality of modern media experience is ably *represented by* holograms and "holograms" but, in addition, these projected images contribute to situations in which encounters with technical ghosts are experienced or at least demonstrated to be a more natural and generic part of modern, everyday life. The very transformation from "real" hologram to imaginary "hologram" is an amplification of the technical image's mythical meaning. Thus, I offer a view of the "hologram" through an extension of Barthes' basic function of the myth in modern visual media — the idea that a culturally constructed imaginary, even an unlikely or seemingly uncanny experience, may be presented as historically given or at least inevitable — which I will augment with a similar concept of mythical depiction, the category of *imaginary media* as described and developed by Eric Kluitenberg and others, as well as his specific suggestion of a spiritual dimension to the imaginary.[11]

The history of this specific imaginary medium — and its own mythical potential — begins with one of the earliest attempts to chronicle depictions of "holograms" within scifi film

[11] Eric Kluitenberg, "On the Archaeology of Imaginary Media," in *Media Archaeology: Approaches, Applications, and Implications*, ed. Erkki Huhtamo and Jussi Parikka (Berkeley, Los Angeles & London: Univ. of California Press, 2011); Eric Kluitenberg, "Second Introduction to an Archaeology of Imaginary Media," in *Book of Imaginary Media: Excavating the Dream of the Ultimate Communication Medium*, ed. Eric Kluitenberg (Rotterdam: NAi, 2006). The imaginary provides a useful theoretical framing for the existence and operation of something like a "hologram." Imaginary is a concept with many flavors, most of which bundle the real and the fictional into a single actant or social force. Within media archaeology, the imaginary has been a potent way of, as stated by Jussi Parikka, one of its leading architects, "thinking media outside of its current actualised examples and to include a variety of discourses and phenomena under the much broader umbrella of media studies in the imaginary mode" ("Media Ecologies and Imaginary Media: Transversal Expansions, Contractions, and Foldings," *The Fibreculture Journal*, no. 17 (2011): 42). Natale & Balbi's survey "Media and the Imaginary in History" examines many different ways media technologies and their social functions are fantasized, from real-world predictions and scientific speculation (what others have examined in terms of the "technological sublime") to science fiction, insisting that "the imaginary should be integrated into media history through an examination of its role in specific phases in the 'life cycle' of each medium" ("Media and the Imaginary in History: The Role of the Fantastic in Different Stages of Media Change," *Media History* 20, no. 2 (2014): 204-205). This chapter shares that perspective: insisting that "holograms" are one cycle of the larger life of this holopresent image set.

and television: “The Evolution of the Mythical Hologram” by David Pizzanelli.[12] Pizzanelli’s paper was presented at a 1992 conference of optical holographers (scientists and artists making the kind of holograms showcased in the previous chapter) and may not be read as significant on a larger scale, but it has provided an organizing principle for my own genealogy of this larger technical-image category. I, too, am seeking to develop a critical history of “holograms,” and Pizzanelli’s paper provides a broad, early sketch for such a project. I say “early” because his chronicle of an imaginary technology predates the emergence of media archaeology, as discussed in my Introduction, by about a decade. Just as media archaeology seeks to amplify the signals of the imaginary and the ignored in histories of technical media, I believe the same methodology applies to its literature and discourse — particularly to this chapter’s analysis of a discursive object. Pizzanelli’s rarely cited paper prehends media archaeological analysis and constitutes a preliminary cue to this specific project as a whole.

Pizzanelli’s brief study is important to this research for two reasons. First, it constitutes an initial historical account of a specific media imaginary: the human form as a spectral, projected technical image. Distinct from but inspired by the optical holograms of the previous chapter[13], this emerging, fictional visual object became what Pizzanelli calls “the mythical hologram,” which he claims “has, in recent years, become subtly infused into the popular concept of what constitutes a real hologram, so that the word ‘hologram’ has a cultural significance over and beyond the literal dictionary definition.”[14] (Nonetheless, as of this writing, the Oxford English Dictionary entry for “hologram” has not accounted for the term’s additional

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[12] David Pizzanelli, "The Evolution of the Mythical Hologram," in *Holographics International ’92* (International Society for Optics and Photonics, 1993). Pizzanelli later earned a Ph.D. in holography from the Royal College of Art in London, and the bulk of his publications since have to do with security printing (using optical holograms for brand packaging and counterfeit protection).

[13] Pizzanelli intimates that optical stereograms, which often showed animated human bodies, produced by Lloyd Cross in San Francisco were “noticed by writers and directors in Hollywood” during the mid-1970s (ibid., 431.).

[14] Ibid.

denotation nor any of its connotations; its only definition remains that of optical holography, and its most recent example of the word's historical usage remains a troubling half-century old, from 1971.[15]) Pizzanelli's chronicle, though, wades into the new definition by charting specific "attributes"[16] of this fictional hologram, listing "holograms" depicted in science-fiction TV and film during the late 20th century. He provides a loose account of early uses of actual optical holograms in film — such as David Bowie, playing an alien in *The Man Who Fell to Earth* (1976), sending holographic images to his wife ("the family photo of the future"[17]), and a rotating set of stereograms seen in the climactic interrogation scene from *Logan's Run* (1976) — and suggests ways that even these depictions of real objects *within* scifi depictions begin to transform the concept of a hologram into what he refers to as a mythical object (what I differentiate here by punctuation as a "hologram"). The *Logan's Run* holograms, for instance, are coupled with sound (3D images of a man's head spinning around while speaking) as if these holograms are screens for multimedia systems rather than captured light waves in a medium plate. This screening of the hologram body begins to facilitate the linking of holograms to computers within pop culture, a relationship cemented the following year in *Star Wars*, the movie "most responsible for the genesis of the mythical hologram"; in fact, from the moment of *Star Wars*' premiere around the world, Pizzanelli says, the technical definition of holograms as diffracted light-wave imagery on a physical surface "is eradicated entirely."[18] Pizzanelli charts a few other film appearances of the emerging "hologram," as well as TV appearances, highlighting the *Star Trek: The Next Generation* series, which he says presents the mythical figure "at its

[15] "Hologram, N.," in *OED Online* (Oxford Univ. Press, 2021).
[16] Pizzanelli, 434.
[17] Ibid., 431.
[18] Ibid., 432.

most sophisticated, most exact."[19] This is the foundation of my own historical account, and I mean for this chapter's critical analysis to strengthen Pizzanelli's original pre-media-archaeological framing of "holograms" by refining the specific technical imaginaries of *Star Wars* and *Star Trek* to a greater resolution.

Pizzanelli's account is a history of what Kluitenberg later classifies as an imaginary medium. Imaginary media are conceptual technical objects and communication channels, media objects and systems that have not been actualized (yet). These objects can appear within artistic representations, popular culture of all types, and fictional narratives, and they are endemic to science fiction (but also present in science itself). They are not merely narrative devices, but they are "strictly discursive objects."[20] This existence as discourse, however, does not decrease their ability to produce material knowledge about the speculative medium or to organize society based on those proposed knowledge practices. But by way of introducing the concept, Kluitenberg adds, "Imaginary media mediate impossible desires,"[21] and we should note his delineation of terms there: the media are imaginary, the desires are impossible.

Let's consider the first part of that, the implication that the medium may not *remain* imaginary — they may *one day* be actualized (or may once *have been*) — perhaps because the

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[19] Ibid., 434.

[20] Kluitenberg, "On the Archaeology of Imaginary Media," 53.

[21] Ibid., 48. Siegfried Zielinski, another pillar of media archaeology, widens the timescale of imaginary media by dividing them into three categories: the untimely (ideas of media that emerge at times when they are unable to be realized, but *may eventually*), the conceptual (media that exist as ideas but will *never* be realized), and the impossible ("imaginary media in the true sense," he says; media that will never be built — *but* "whose implied meanings nonetheless have an impact on the factual world of media") ("Modelling Media for Ignatius Loyola: A Case Study on Athanasius Kircher's World of Apparatus between the Imaginary and the Real," in *Book of Imaginary Media: Excavating the Dream of the Ultimate Communication Medium* (Rotterdam: NAi, 2006), 30). Any classification of "holograms" by this rubric depends on the historical moment and the technical information available in it. The systems described in this chapter may be untimely (like the history of holography itself, they might be theories ahead of their time), may be merely conceptual (it would take a pretty clever hack of physics, for instance, to get light to change direction in mid-air without a screen surface, as would be required by the scifi "holograms" in the following analysis), but are most likely impossible in Zielinski's "true sense," since whether or not they *will be* actualized is not as important as the impact they have and are having on real-world media in the broader moment of their experience.

very desire for it sets in motion the discourses and practices that may facilitate its actualization. We have seen this with the actual hologram, which existed as an imaginary medium — a *scientific* fiction — for a decade before the technologies that could actualize it were invented. (Pepper's Ghost, too, was a relatively well-known optical illusion long before it was concretized into a media system at the Polytechnic.) Pizzanelli's "mythical hologram" indexes a similarly fictional object beyond the ability of existing technoscience to actualize, whose theoretical potential happens to be depicted and experimented with in pop-culture narratives rather than scientific papers. This somewhat transmedia story of hologram into "hologram" actually drove Pizzanelli's delineation of fictional visual objects from real ones in order to speak to his audience of optical holographers, who by '92 were beginning to address what they saw as the "misuse" of their real work's root words to label fictional depictions. Even contemporary optical holographers remain realistic about the fact that projecting a coherent 3D image into thin air *a la* the visual effects in *Star Wars* and *Star Trek* remains an impossibility, that "such applications are still science fiction."[22] Notably, in the early 1980s, holography pioneer Stephen Benton minced no words to this effect: "R2-D2's projection of Princess Leia's spatial image … has stuck in the minds of millions of people who ought to know better. Photons do not yet turn around in mid-air, as they would have to for such a result."[23] But note some specific language there: despite the pushback against scifi's normalization of the sight of a possibly impossible technology, both note that this concept is "still" fictional and has "yet" to be realized. This is key to surfacing a discourse of destiny, if not inevitability, surrounding the "mythical hologram." Even around MoH exhibits, news reports consistently contrasted the optical holograms on display with the novel imagery seen in *Star Wars*, adding comments like, "This image was created by special

[22] Stéphane Larouche and David R. Smith, "Optics: Nanotube Holograms," *Nature* 491, no. 7422 (2012): 47.
[23] Stephen A. Benton, "Survey of Display Hologram Types," *Industrial and Commercial Applications of Holography* 2 (1983): 4.

effects for the movie, but it's a fair representation of what many scientists believe holography will achieve in the future."[24] The scifi "hologram" functions like a myth in reverse: instead of explaining past phenomena, scifi projects abstractions that have not yet materialized — providing, as Vivian Sobchack noted about the genre, "a kind of 'prophetic "neo-realism," which reality corroborates after the fact'"[25]; such corroboration is now institutionalized as "design fiction," an accepted term for narrative practices applied to real-life R&D.[26] This is the historical rhythm of holopresence: theories and abstract ideas precede more literal projections into reality, as if successive social groups keep expressing certain discourses about life and immateriality via new forms of the same experience.

But what is it that various practitioners keep seeking to manifest in holograms or "holograms"? Pizzanelli also refers to the scifi "hologram" as "an idealised form, more clearly expressing the human needs and desires which are integrally bound up with the medium,"[27] using the same terms Kluitenberg will use in locating "impossible desires" mediated by an

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[24] News clipping, "Holography: The New Dimension" by John Bliss, unknown source and date, Exhibit: *NYC Hall of Fame, The Holofame*, Box 34, File: "News Clippings 1977-1979 #1087," Museum of Holography archives, MIT Museum, Cambridge, Mass.

[25] Sobchack, 55, quoting from Jacques Siclier and Andre S. Labarthe, *Image De La Science-Fiction*, trans. Vivian Sobchack (Paris: Les Editions due Cerf, 1958), 124.

[26] See Anthony Dunne and Fiona Raby, *Speculative Everything: Design, Fiction, and Social Dreaming* (Cambridge, Mass. & London: MIT Press, 2013); Bruce Sterling, "Patently Untrue: Fleshy Defibrillators and Synchronised Baseball Are Changing the Future," *Wired*, Oct. 11 2013. Consider this speculative survey for computer interface designers: Nathan Shedroff and Christopher Noessel, *Make It So: Interaction Design Lessons from Science Fiction* (Brooklyn: Rosenfeld Media, 2012). Brian David Johnson's book is entirely based on the notion of *Science Fiction Prototyping: Designing the Future with Science Fiction* (Morgan & Claypool, 2011). This recent textbook promises students, "Today's digital systems are yesterday's science fiction": Sarah Harris and David Harris, *Digital Design and Computer Architecture* (Waltham, Mass.: Morgan Kaufmann, 2016), 519.

[27] Pizzanelli, 430. He also adds that these needs and desires "are not so clearly discerned in a study of the actual medium itself" (ibid.) as they are via a study of the fictional iterations. Ahem: Social desires may be discerned quite clearly by both methods — by a situated study of the actual medium (such as my previous and forthcoming chapters) as well as this critical analysis of the same concept in an idealized form — and, as I show, both offer different perspectives (befitting a study of holograms) on certain "needs and desires" being enacted by and through a real or imaginary technology. But, granted, scifi's particular anything-goes headspace does allow for a broader palette of experimentation and play with concepts, which can illuminate a fuller scope of "needs and desires" sought from the medium.

imaginary technology that, he says, "has to fulfill real-world needs to survive."[28] Like Pepper's Ghost and the optical hologram before it, the scifi "hologram" engages with common desires to commune with the dead, even as far as conducting physical interpersonal interactions with summoned spirit bodies. As I will show, fictional experiments with the "hologram" depict various ways that humans might remain posthumously embodied to some degree (intersecting more directly now with contemporary discourses of life extension and the technological singularity) and ways that vast distances may be covered for just such interactions, through the magic advances of a particular technical imaginary. Kluitenberg refers to a specific kind of imaginary media he calls a "connection machine," one used to "coordinate not only the affairs between humans, but also between that which is human and that which is divine."[29] At one point, he considers numerous technologies envisioned by famous inventors — Nikola Tesla's Wardenclyffe Tower and Thomas Edison's "spirit phone," both real-life imaginaries in that they were never actually constructed — as media conceived for the impossible yearning to contact and communicate with the dead. He stops short of referring to such desires as universal, though he notes that any perceived dodginess about such claims by such seminal historical figures has not seemed "to discredit the status of these individuals within this specific historical trajectory, [thus] it would follow that the resident belief structure that feeds these ideas extends far beyond the immediate surroundings of the historical protagonists of obtuse techno-mysticism."[30] Nonetheless, even when (as mentioned) the "hologram" is representative of the living rather than the dead, its spectral form materializes similar discourses and opens up a playground for the manifestation and experimentation with techno-mysticism. This is the field of holopresence, on

[28] Eric Kluitenberg, "Connection Machines," in *Book of Imaginary Media; Excavating the Dream of the Ultimate Communication Medium*, ed. Eric Kluitenberg (Rotterdam: NAI, 2006), 162.
[29] Ibid., 158.
[30] Ibid., 161.

which the impossible desires of both "hologram" spectators (who seek communion with the immaterial) and their producers (who promote ideologies of technoscientific superiority proclaiming the possibility, if not inevitability, of producing such experiences) is negotiated through either side of the "connection machine."

The difficulty in studying imaginary media as signifiers of situated needs and desires is that, while some narratives *contain* the imaginary object itself, they *depict* perfectly normal social relations around it. Kluitenberg notes that often "the imaginary medium under scrutiny is not even recognized as a medium by its protagonists," concluding, as he himself comes back around to the subject of myth (with an endnote pinging Barthes), that "the objects present themselves as myth rather than as a discursive formation."[31] This is precisely my point here — that many of these narratives operate not only as crystallizations of particular discourses but as situated depictions of social relationships between humans and objects, between bodies and ghosts, within mythical media ecologies that blend the real and the virtual. For Kluitenberg, though, Barthes' concept of mediated myth functions almost like the "hologram" apparatus itself: estranging existing objects, subjects, or environments from their original meanings in order to use those "as a clean projection surface for a whole new range of significations."[32] The "hologram" superimposes its myth of Kluitenberg's "technological transcendence" onto existing reality by normalizing the idea of both a technically possible spectrality and the discursive practices in which humans and those technical specters would interact. Human relations with "holograms" thus seem, by Barthes' terms, "normal," "common-sense," a reflection of "the way things are"[33] — or may be. Whether or not actualization is possible means nothing to Barthes'

[31] Kluitenberg, "On the Archaeology of Imaginary Media," 54.
[32] Kluitenberg, "Connection Machines," 181.
[33] Roland Barthes, *Image Music Text* (London: Fontana, 1977), 45-46.

mythological function; his myth is "no longer concerned with facts except inasmuch as they are endowed with significance."[34] The "hologram" is and may remain imaginary, but its significance is what matters, acting and organizing in the world and serving its current needs and desires.

Projecting the myth: *Star Wars* and the projection of 'hologram' spaces

The point at which a public concept of an actual hologram transmuted into an imaginary "hologram" within Western pop-cultural consciousness can be pinpointed precisely. It occurred during two scenes early in the original *Star Wars* film, scenes that depict an entirely new idea of what a hologram might be (or become) and that introduce a new imaginary about how such radically novel imagery might function within societies. The original *Star Wars* blockbuster film (1977) is a space opera set famously "a long time ago," yet its "machine aesthetic"[35] is commiserate with the technical futurism typical of science-fiction spectacles in the West for a century preceding its premiere.[36] As mentioned, Pizzanelli refers to *Star Wars* as being "most responsible for the genesis of the mythical hologram."[37] When the audience is first shown a "hologram" in *Star Wars*, the technical image is indeed something altogether different than the optical holograms described in the previous chapter, in terms of both its production method and the appearance of its resulting imagery. It is not a scientific object, *per se*, nor is it overtly aesthetic. The initial "hologram" of *Star Wars* is a mundane communication device, a cumbersomely delivered iteration of an enhanced video-mail message from the movie's damsel in distress, Princess Leia Organa, to the exiled general Obi-Wan Kenobi.

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[34] Barthes, *Mythologies*, 220.
[35] Rubey.
[36] See Sobchack, and Thomas Lombardo, *Contemporary Futurist Thought: Science Fiction, Future Studies, and Theories and Visions of the Future in the Last Century* (Bloomington, Ind. & Milton Keynes, UK: AuthorHouse, 2006).
[37] Pizzanelli, 432.

Princess Leia's now-famous message — "so familiar for the baby boom generation," Sean Johnston notes[38] — is recorded by a robot, which occurs mostly off-camera in the film's first sequence (**Figure 3.1**). During a battle aboard a spaceship, the princess stashes secret plans inside the squat, cylindrical droid R2-D2; she then uses its built-in "holographic" media function to record a plea for help, instructing the robot to deliver itself and her message to Kenobi on another planet. Through miraculous narrative happenstance, R2-D2 and his robot companion, C-3PO, wind up on Kenobi's home world and manage to deliver Princess Leia's "holographic" message. A portion of the message is first played back for the film's young protagonist, Luke Skywalker, before being delivered in full to the elderly Kenobi the following day.

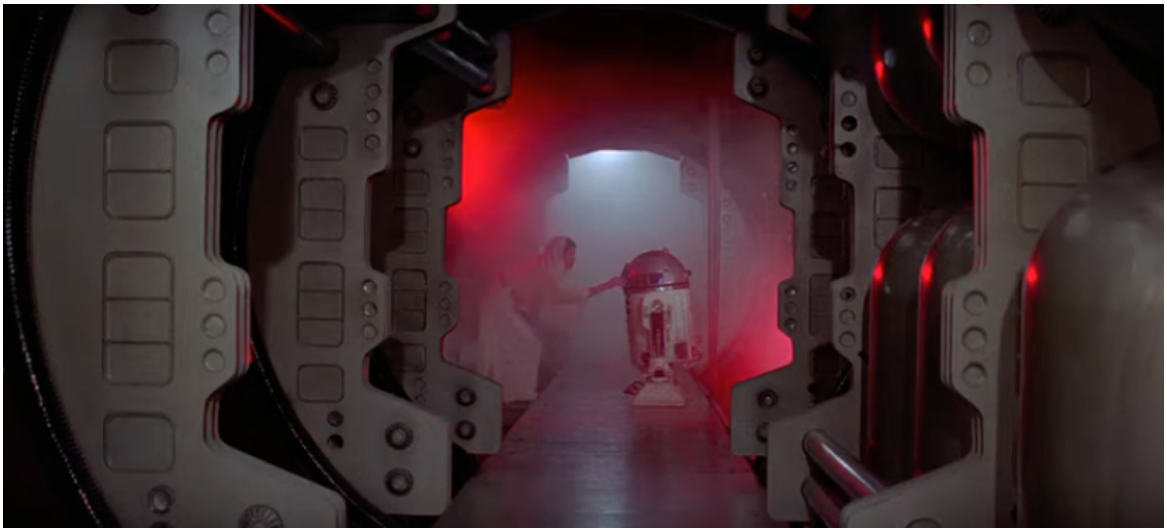

Figure 3.1. A brief frame in the opening sequence of *Star Wars* shows Princess Leia recording her "hologram" message in haste. She is shown bending forward to operate controls on the robot R2-D2, a pose repeated at the end of her 3D "hologram" message shown in a later scene.

[38] Sean Johnston, *Holograms: A Cultural History* (Oxford: Oxford Univ. Press, 2016), 197. Also, the very fact that I can refer to this imagery as "famous" — this imaginary media depicted within actual media — speaks to the ontological boost the "hologram" concept receives from this depiction. In this film, there is the character of Princess Leia, and there is "the Princess Leia hologram" — the latter being *seen* within popular culture almost as a separate entity entirely.

The two scenes showing playback of the message are the focus of this first description and analysis. My purpose is twofold. First, these scenes redefine the term "hologram" and divorce it from its historically situated real-world meanings, if not its connotations of spectral presence. It is important to note, however, that this redefinition occurs entirely off-screen in real-world discourses. The word "hologram" is never spoken in *Star Wars*. In fact, no one in the original *Star Wars*, or in the following four films, ever refers to Princess Leia's message or any other technical-image projection as a "hologram," despite such imaginary media pervading the films. Not until 2005, in fact, did audiences hear a *Star Wars* character label one of these images as such, and even then it was in passing ("I have seen a security hologram of him"[39]). But the imagery is described in the original script drafts as a "hologram," and the term's redefinition projects into public and critical discourse surrounding the successful film and each of its sequels.

Secondly, these depictions of a single "hologram" construct a visual template for a particular kind of "connection machine" that is used as the most common communication medium throughout the resulting *Star Wars* franchise. By doing so, these first scenes establish the spatial, physical, and social requirements for a viewing subject's particular interactions with the imaginary medium. That is, the film's particular usage of the imaging device for transmitted, technical communication — especially its specific look and its participation in social interaction, as shown by the arrangement of viewing subjects within the scenes — offers poignant speculation as to how a spatialized, spectral image might not only manifest the particularly potent presence of an absent person but might allow that person more powerful social positioning among the subjects with which they are projected. Certainly, these depictions establish a template for how "holograms" and interactions with them will be depicted throughout the rest of

[39] George Lucas, *Star Wars, Episode III: Revenge of the Sith* (20th Century Fox, 2005).

the resulting transmedia franchise, each time demonstrating for audiences a virtually new idea of this technical image form and how it might be situated within social interactions.

In the first scene, Skywalker is in his garage, cleaning both robots after acquiring them through trade. Attempting to dislodge a stuck component on R2-D2's front panel, he accidentally triggers the playback of the stored message — but only a portion of it, Princess Leia's final and most famous lines ("Help me, Obi-Wan Kenobi. You're my only hope"), which repeats continuously like a skipping record.[40] An animated image of the princess, standing in bright white robes, materializes in the middle of the room — a small image, about a foot high — and voices her plea before bending forward to switch off what is now an unseen medium (**Figure 3.2**). The same few seconds of the animation begin repeating, which occurs throughout the rest of the scene as Skywalker converses with the robots. What the audience sees here is an image of a person that in many ways, at the time, looks like a traditional cinematic representation — a film of a film. Several characteristics of the technical medium on display contributed to this initial perception: the visibility of the projection, the size of the projected image, and the imperfections of its display.

[40] The sound of the Princess' voice assumably resonates from some kind of speaker on the robot also projecting the imagery, but no dissociation of image and sound is indicated in these scenes. Her voice seems to emanate from her image, as if the "hologram" itself could speak. As Barthes suggests that the projecting beam of cinema is seen but not seen, he extends the movies' similar performance of separate-but-equal sensory experiences, noting that "sound is merely a supplementary instrument of representation; it is meant to integrate itself unobtrusively into the object shown, it is in no way detached from this object" ("Leaving the Movie Theater," in *The Rustle of Language* (New York: Hill & Wang, 1975/1986), 347), which seems to be the case here.

Figure 3.2. In this scene from *Star Wars*, the robot R2-D2 projects the "hologram" of Princess Leia for the first time. The imagery's projection beam is clearly visible between the robot and the "hologram," and the miniaturized 3D figure of the princess is situated on the surface of the floor rather than in mid-air.

First, the mechanism of the image's delivery is clearly visible and would have been immediately recognizable as a kind of media projection to most viewers watching the film in 1977. Princess Leia's image appears at the end of a bluish beam of light emitted from a lens slightly protruding from R2-D2's domed head. Early viewers of the film in movie theaters were watching a projection of a projection: above them, a similarly bluish beam of light shone from the projection booth to manifest the film itself on the theater screen, and in that projected film a similar technology seemed to be projecting the image of the princess as a cinematic projection for a smaller audience of these three depicted viewing subjects. However, no screen is visible in the scene that might be capturing the light of R2-D2's projection. The image of the princess is upright, as opposed to splaying out on the floor (as one might expect of a cinematic projection

given the arrangement of objects and actors in the space), but it is not cast against a wall or other visible vertical surface. Given what's been described in the previous chapters, this image theoretically could have been realized as either a Pepper's Ghost illusion (reflected in a small invisible screen standing on the floor) or an optical stereogram (rotating somehow in the scene to display its animated image). With appropriate masking of the transparent surfaces required for those displays, either imaging system could have presented the effect live in the scene. However, as indicated in both previous chapters, Pepper's Ghost and optical holograms had not succeeded in gaining wide popular attention (certainly not as wide as *Star Wars* reached around the world). Thus, *Star Wars* audiences — most of whom were conditioned by then to certain expectations of fantastic visuals within the scifi genre — likely assumed the presence of a "special effect." Which it was — the visual of Princess Leia's message was created using an effect common in cinema at the time: a simple superimposition of the actress playing the princess (filmed separately) onto the scene filmed in the garage. Mark Hamill, the actor playing Skywalker, saw no princess before him during the filming of the scene; like the actor playing Redlaw on the Polytechnic stage during the premiere of Pepper's Ghost, Hamill pretended to be viewing the image, which was added in postproduction.

Secondly, as mentioned, the image of Princess Leia's figure appeared greatly reduced in size. Traditional media almost always shrinks its subjects — there have been few popular life-size film projections or television displays — so this, too, would not have signaled anything radically novel about the depicted image to the film's initial audiences. Princess Leia appears before these three spectators about a foot tall, according to the shooting script. (Notably, Princess Leia's image shrank as the script was drafted. Her projection was described in original script

notes as two-feet tall,[41] then 15 inches[42] and, finally, 12 inches.[43] Lucas' final draft describes "a twelve-inch three-dimensional hologram of Leia Organa … being projected" from the lens on the robot's head.[44]) This causes the viewing subjects in the scene — all of whom are male[45] — to both tower over the manifested princess, looking down on her in order to view her message.[46] Perhaps because of this smaller stature, the image of the princess shows her full body throughout the message. This is the first characteristic signaling any possible divergence from traditional cinematic codes. Films, including the scene audiences were then seeing, often show their subjects in close-up views which are necessarily cropped by the image frame. Princess Leia's full body is in view of the fictional spectators throughout the message, though her lower half is often cropped for the close-up view of the actual film audience. But the "hologram" itself is depicted as *not* cropped and remains continuously complete to the depicted spectators throughout its playback. Audiences see an image that remains as whole as the human characters.

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[41] George Lucas, *The Star Wars: Adventures of the Starkiller* (Lucasfilm Ltd., 1975).

[42] George Lucas, *The Star Wars: From the Adventures of Luke Starkiller* (Lucasfilm Ltd., 1975).

[43] George Lucas, *Star Wars: The Adventures of Luke Starkiller* (20th Century Fox, 1976).

[44] George Lucas, *Star Wars: Episode IV, A New Hope* (20th Century Fox, 1977), 19.

[45] Skywalker and Kenobi are male characters, but apparently the droids are, too. The anthropomorphic, bipedal C-3PO is voiced by a male British actor, signifying a gender identification. R2-D2, oddly, is also considered within the fanbase to be somehow male, despite possessing no typical means of signifying gender. (He's a trash can on wheels, and his voice is audible only as electronic beeps.) But characters in the film consistently refer to the robot with masculine pronouns, and the entry for R2-D2 in a published guide to the film series' characters, considered by fans to be an "official" source of information on the franchise, lists the character's sex as "masculine programming" (Daniel Wallace, *Star Wars: The Essential Guide to Characters* (New York & Toronto: Del Rey, 2002), 138).

[46] The positioning of the subjects and the camera here classically enacts the male gaze of cinema as identified by Laura Mulvey ("Visual Pleasure and Narrative Cinema," *Screen* 16, no. 3 (1975)). The film's script instructs, "Luke has been looking longingly at the lovely, little princess" (George Lucas, "Star Wars: Episode Iv, a New Hope," (20th Century Fox, 1977), 20) — a line that both underlines his awe but also frames the female character as controlled, projected, and reduced in both size and stature (C-3PO earlier notes that she's "a person of some importance" [19-20]) — and the script describes the repeated hologram image in highly aestheticized terms: "the beautiful young Rebel princess," "The lovely girl's image" (30), infantilizing and objectifying her. For analyses of this and other feminist readings of *Star Wars*, see Philip L. Simpson, "Thawing the Ice Princess," in *Finding the Force of the Star Wars Franchise: Fans, Merchandise, and Critics*, ed. Matthew Kapell and John Shelton Lawrence (New York: Peter Lang, 2006); Diana Dominguez, "Feminism and the Force: Empowerment and Disillusionmenbt in a Galaxy Far, Far Away," in *Culture, Identities and Technology in the 'Star Wars' Films: Essays on the Two Trilogies*, ed. Carl Silvio and Tony M. Vinci, Critical Explorations in Science Fiction and Fantasy (Jefferson, N.C. & London: McFarland, 2007).

Finally, the projection of the princess appears imperfect in ways that likely would have signified a TV or video image to a sizable portion of the audiences (see **Figure 3.3**). Leia materializes from and dematerializes into smears of static, indicating an electronic (not optical) image. That static slides across horizontally pixelated scan lines — the horizontal stripes that constitute a televised or video image[47] — which are visible in Leia's image throughout the playback of the message. In addition, the original "hologram" of Princess Leia features barely visible horizontal bands of slightly altered hue rolling through the image from top to bottom. This, too, was a feature of video imagery recognizable to many spectators at the time of the film's original release. These features are specified in the film's script, which calls for an image of the princess that "flickers," plus, "There is a little static."[48] Seeing imperfections that signify video transmission in what first appears to be an optical cinematic projection may have created a bit of bewildering dissonance in the minds of audiences, but not enough to herald truly radical characteristics of this image. Notably, Lucas has twice refreshed his original film to not only add additional scenes but to refine the clarity and resolution of other special effects, and neither reissued cut of *Star Wars* alters the "hologram" of the princess. Even to younger, digitally native audiences, the "hologram" continues to look like an older, analog projection.

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[47] As early as the 19th century, the desire to transmit imagery via analog electronic systems (telephone lines or radio signals) led to the breaking down of those images by means of raster scanning: subdividing an image into a sequence of horizontal lines, which are scanned optically and converted into electronic signals for transmission. The receiving device then stacks those lines in the prescribed order, thus rebuilding the image. This gave early television and video its raked appearance upon close-up inspection. (I recall as a boy pressing my nose against the large television screen in our living room, fascinated by seeing its imagery broken down into flickering lines, like first viewing of a pointillist painting from different distances.) The thickness of the scan lines determines the resolution of the image. Contemporary HDTV uses thousands of scan lines or more to re-create highly detailed imagery — much more than the 525 lines (in the United States) of 20th-century television and video (Tony White, *Animation: From Pencils to Pixels* (Burlington, Mass. & Oxford: Routledge, 2012), 486). Boosting this resolution increases the amount of data transmitted by the signal, and this is for 2D imagery; to scale the process up to 3D imagery would expand the signal requirement exponentially. Even to produce a relief image with a range of 30 to 60 degrees of parallax, the order of magnitude for scan lines and pixels in a simple image of moderate resolution skyrockets ("As one surprised MIT freshman put it, 'That's, like, a million TV screens!'") (Stephen A. Benton and V. Michael Bove, *Holographic Imaging* (Hoboken, N.J.: John Wiley & Sons, 2008), 249).

[48] Lucas, *Star Wars: Episode IV, A New Hope*, 30.

Figure 3.3. The "hologram" figure of Princess Leia in *Star Wars* first appears (left) as a 3D image true to color though slightly pixelated and washed through, from bottom to top as the message replays, with scan lines. When the "hologram" message is initiated and terminated, the image suffers smears of static (right).

Lucas did not create his "hologram" out of whole cloth, however. I've mentioned the trajectory of science fiction toward influencing real-world technical development, but this is not a one-way street. Actual science inspires its fiction, too, and Lucas *explicitly* cross-bred his imaginary technical image from his own experiences of viewing optical holography. In his script drafts for *Star Wars*, the initial description of Princess Leia's "hologram" does not describe the true-to-color video effect audiences see in the finished film. Lucas' original concept of the "hologram" was an image showing "a rainbow of colors as it flickers and jiggles in the dimly lit garage."[49] Early drafts of the story and script[50] featured various iterations of some kind of computer-projected, three-dimensional message — basically a cumbersome, asynchronous form of extra-dimensional video-mail — without calling it anything other than a "projection"; by the

[49] Lucas, *Star Wars: Episode IV, A New Hope*, 19.
[50] George Lucas, "The Star Wars (Story Synopsis)," (Lucasfilm Ltd., 1973); George Lucas, *The Star Wars* (Lucasfilm Ltd., 1974).

second draft Lucas applied the label of "hologram."[51] Both descriptions combine elements of existing white-light optical holograms (the "rainbow of colors") — Sean Johnston mentions that Lucas' description "sounds like a Multiplex hologram" — and unsteady video reception (the flickering image). Johnston also notes that, in the end, "[t]he eventual cinematic representation distanced itself from what sounds like a Multiplex hologram."[52]

In addition to the strict visual representation of the imaginary imagery, the *mis en scene* in the production of these two scenes with the Princess Leia "hologram" contributes to the idea that this technical image is something altogether new and more dimensional than, as we have seen in this dissertation, either Pepper's Ghost or optical holography. In both those cases, the flat surface of the image medium (the Pepper's Ghost screen, the hologram plate) limits the ability of a spectator to see *all* possible sides of the presented imagery. But through the positioning of both the film camera and the depiction of the viewing subjects throughout these two scenes, Lucas communicates two chief distinctions of his new "hologram": the image is volumetric and three-dimensional — wholly visible from any angle — and this spatiality arranges its viewing subjects differently from previous screened visual media, presenting the image less as an image mediated *for* an audience and more as image participating *among* a social group.

Lucas' camerawork easily establishes the dimensionality of the Princess Leia "hologram." In the first scene with the projected message, her image is partially ringed by Skywalker and the two robots (who are also viewing subjects in this scene, even R2-D2, who both projects the image and views it). In the rapid cycling of shots that follows, the audience is shown views of the princess' projected figure from three separate angles: level from slightly behind her right side (a viewing position opposite of the depicted spectators), level from behind

[51] Lucas, *The Star Wars: Adventures of the Starkiller*.
[52] Sean Johnston, *Holographic Visions: A History of New Science* (Oxford: Oxford Univ. Press, 2006), 407.

her left side and, most often, slightly above from her left side (the closest to Skywalker's point of view). This communicates both the dimensionality of the image from differing vantage points — it is volumetric (filling a certain space in the garage) and 3D (viewable from all sides) like an actual body — as well as its general coherence and consistent parallax from a variety of subject positions. These perspectives mark the image as distinct from traditional cinematic projection, yet the visible projection beam negates the image as an optical stereogram.

The image's dimensionality is underscored in the second scene by similar camera treatment and a few extra suggestions as to its novelty. In this much shorter sequence, Princess Leia's message is displayed before the previous three spectators plus Obi-Wan Kenobi, its intended recipient. Kenobi activates the projection, which is again emitted from R2-D2's lens, and this time the audience sees and hears the princess' plea in full.[53] The robot aims the projection at a small coffee table in the center of Kenobi's desert hut. Again, the projected image is not laid out on the flat surface of the table but stands erect on it as a three-dimensional figure. (In fact, upon initialization, the image seems to appear ever so slightly above the table, about an inch over the surface; the robot then quickly levels her feet down to the tabletop, as if responding to a potentially perceived anomaly should the full-body image of a human not appear with its feet on the ground!) As the princess makes her plea, again the camera shows the audience her projected image from three separate angles, signifying its volume and dimensionality. This also wrenches what may seem to be a traditional cinematic projection from its screened context and situates that 3D image within a kind of *theater-in-the-round*, in which the image-actor exists

[53] "General Kenobi, years ago you served my father in the Clone Wars. Now he begs you to help him in his struggle against the Empire. I regret that I am unable to present my father's request to you in person, but my ship has fallen under attack and I'm afraid my mission to bring you to Alderaan has failed. I have placed information vital to the survival of the Rebellion into the memory systems of this R2 unit. My father will know how to retrieve it. You must see this droid safely delivered to him on Alderaan. This is our most desperate hour. Help me, Obi-Wan Kenobi, you're my only hope" (Lucas, *Star Wars: Episode IV, A New Hope*, 30).

within the same social space as its spectators rather than being isolated from them in a frame or behind a screen. Like the ambitions of theater-in-the-round as reimagined within the mid-20th century,[54] this rearrangement of performer and viewer rebalances the depicted social positionings and power relations, affording the image greater naturalized presence within the mediated encounter.[55] In theater-in-the-round, the elimination of the stage proscenium (the invisible "fourth wall") not only increases the presence of actors among audiences but also elevates the audience's participation in the event. A similar adjustment is depicted in this scene, enhancing Leia's spatial presence and, in turn, nudging the depicted viewing subjects away from passive spectators and toward becoming more active participants in the encounter.

A final establishing shot concretizes the radical novelty of this imaginary communication media. Both sequences depicting the Princess Leia message include wide shots featuring all spectators and the princess' projected image within the film frame. Toward the end of the second sequence, however, the scene lingers on a slightly cropped wide shot (**Figure 3.4**) that — crucially for my analysis here — eliminates the projecting robot. In this moment, the audience sees Skywalker, Kenobi, and C-3PO seated and gazing at Princess Leia in the center of a carefully arranged tableau. The source of her projection — a technical apparatus now off-camera and away from each character's gaze (and now also the audience's) — is now invisible. The media apparatus (notably, the least anthropomorphic character in the scene) is able to deliver its message into the social encounter without being fully accounted for. The subjects in the depicted social interaction are a human, a robot, and a spectral, technical image; the projecting robot is unseen. This solidifies the technical image as an idolatrous actant within the social encounter. Each spectator looks at and interacts with the image itself rather than the mediating apparatus.

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[54] Margo Jones, *Theatre-in-the-Round* (New York: Rinehart, 1951).

[55] Peter Cheeseman, "Theatre in the Round: Practical Aspects," in *The Continuum Companion to Twentieth Century Theatre*, ed. Colin Chambers (London & New York: Continuum).

The “hologram” (even in miniature) participates in the encounter to a greater degree than a screened image — almost *as if* she were another person in the room. Princess Leia’s message concludes by disintegrating before the visible spectators (again in the same smear of static), and Kenobi leans back in his seat, staring thoughtfully into the empty air the princess’ image had previously occupied. His thoughtful affect is a social cue: we, too, are meant to think about what has just occurred and what we’ve seen, and to consider the implications going forward.

Figure 3.4. The final shot of the Princess Leia “hologram” in *Star Wars* eliminates the projecting apparatus to show only three holosubjects (two humans and the other robot) looking at the image rather than its producing technology.

The visual characteristic that the Princess Leia “hologram” carries forward from the previous spatial technical imagery of this study, such as Pepper’s Ghost and optical holograms, is its spectrality. In this case, the immateriality of the technical image is only depicted visually and is signified by translucence. Like many optical holograms or stereograms, Princess Leia’s animated message appears to be slightly transparent throughout both scenes. When the princess first appears in Skywalker’s garage, the audience can see the grating of the floor showing slightly through her white robes. When she reappears on Kenobi’s table, the edge of the furniture is

visible through her figure (**Figure 3.5**), and details of the room behind her can be discerned within her figure in the wider shots. In addition to her transparency, the princess' white robes add to her imagery's signifiers of ghostliness.[56] But these visual cues are the only signifiers of the *Star Wars* "hologram's" spectrality. Unlike encounters with optical holograms, as previously discussed, the spectators depicted do not react to their interaction with the image by reaching out in an attempt to touch it. The transparence of the image suggests to the audience that if Skywalker were to reach out and touch the princess, his hand would find only air, like an optical hologram. But no spectator in these scenes acts out this gesture of holography. Instead, the princess *herself* enacts the gesture, beginning and ending the communiqué by reaching forward to switch the robot on and off. Since the audience does not see the robot in the resulting projection, the princess merely appears to fulfill the image's role in the gesture — the ghost reaching for the human (as occurred on stage at the Royal Polytechnic Institute when Pepper's ghost reached for the actor playing Redlaw).

[56] Princess Leia's virginal white robes may signify her spectrality, but that spectrality itself is also a signifier — often of hidden power and lurking evil. Many *Star Wars* villains first appear in the narratives as "holograms": the emperor Palpatine in *The Empire Strikes Back*, Darth Maul in *Star Wars: The Phantom Menace*, Supreme Leader Snoke in *Star Wars: The Force Awakens* (this time as a much larger-than-life projection). The Death Star space station itself, the technological symbol of evil throughout the first trilogy, is (chronologically) first shown to the rebel heroes as a digital technical image displayed as a "hologram" in *Star Wars: Attack of the Clones*.

Figure 3.5. In this detail of a frame from the second Princess Leia "hologram" scene in *Star Wars*, the figure's spectrality can be seen in the visibility of the table's edge and background furnishing through her gown.

None of this elicits a sense of awe in the depicted viewing subjects, at least in the scenes shown to the audience, as was common to the early encounters between spectators and the previous cases in this study, Pepper's Ghost and optical holograms. That is, in these scenes the awe that is depicted is situated differently. Skywalker does stare at the "hologram," showing in his face a fair degree of wonderment, which the script itself calls for ("Luke's mouth hangs open in awe"[57]). But this emotional reaction is in response to the content of the message rather than its medium. "She's beautiful," Skywalker says,[58] entranced by aesthetics rather than technics — because the audience is led to believe that this communication format is neither radical nor novel within the depicted universe. This is not the first "hologram" that Skywalker or the robots have viewed and interacted with. Even before the subsequent films and other franchise narratives show audiences the ubiquity of hologram projections throughout this narrative universe, the

[57] Lucas, *Star Wars: Episode IV, A New Hope*, 19.
[58] Ibid.

codes of science fiction by this point already have set a hegemonic standard of technological futurism in their depicted worlds. Seeing, hearing, and interacting with transparent, spectral imagery may be a minor spectacle to audiences in the 20th century, but to the futuristic characters depicted in the film such interfaces are utterly normal, perhaps even mundane. If there was any widespread social wonderment at the capability of a digitally projected ghost image to interact with fully material human beings in this far-away galaxy, it must have happened a long time ago.

But in this galaxy — and this is the second distinction established by the construction of these film scenes — "holograms" are fully present in situated communication *despite* their depicted spectrality. As *Star Wars* narratives proliferate, "holograms" not only remain omnipresent as communication media, their immaterial imagery is presented in the context of material social interactions. In future films, audiences see "holograms" depicted as smaller-than-life imagery for communication transmissions (often synchronous and "live" rather than the asynchronous delivery of Princess Leia's original plea) and, with increasing frequency, life-sized projections of bodies, usually in the context of telepresence. The spectral bodies of the "hologram" projection often appear proportional to the human bodies in the interaction and situated in space in ways that do not disturb the typical aspects of a physical encounter. That is, their spectral nature is, like Princess Leia's original message, only signified visually. The *Star Wars* "hologram" is not revealed to be spectral by floating above the floor or walking through walls, nor do audiences witness many instances of humans passing hands or objects through the projected body. Throughout the *Star Wars* universe, proportional "holograms" exist on a level playing (or phenomenal) field with the human bodies they interact with. Spectrality in the *Star Wars* universe, then, is not a barrier to full participation in social interaction. The film depicts this imaginary not only as possible but as normal and mundane.

Even human encounters with *actual* specters in *Star Wars* are depicted as normal, almost blasé circumstances. At the end of the first *Star Wars* film, Kenobi allows himself to be slain by the villain, and in those first fresh, spoiler-free years most audiences assumed this was meant to inspire the young Skywalker to follow in his heroic footsteps. In the sequel film, *The Empire Strikes Back* (1980), however, Kenobi appears to Skywalker as a ghost. This occurs while Skywalker suffers a near-death trauma, and audiences are led to believe that the speaking image of Kenobi may be a vision. (The script is explicit: "It is hard to tell if Kenobi is real or a hallucination."[59]) In the third film, *The Return of the Jedi* (1983), Kenobi's full-sized embodied ghost strolls out of a woodland to have a three-minute chat with Skywalker, who immediately accepts the presence of his old master, barely batting an eye at the transparent, slightly glowing, blue-tinted figure walking toward him (**Figure 3.6**). Indeed, this depiction of a ghost is unusually materially aware — ducking under branches and sidestepping shrubs rather than floating through them. He even sits on a log to continue the conversation, as if he's still a tired old man. The chief cue for the audience that this person is a specter of some sort is again entirely visual — and remarkably similar to the technical significations of spectral "holograms." Kenobi's ghost is slightly transparent (we can see tree trunks and hanging vines through his spectral body) and his entire figure is tinted blue. The only aspects of his appearance different from a projected "hologram" are the absence of the technical glitches and an added, slightly flared glow around the perimeter of his spectral figure. The interaction with Kenobi serves to explain a few of the franchise's by-then notorious narrative leaps for Skywalker, who justly challenges the logic of the old ghost's claims. Kenobi hedges:

[59] Lawrence Kasdan and Leigh Brackett, *Star Wars: The Empire Strikes Back* (20th Century Fox, 1980).

> KENOBI: What I have told you was true … from a certain point of view.
>
> LUKE: (*turning away, derisive*) A certain point of view!
>
> KENOBI: Luke, you're going to find that many of the truths we cling to depend greatly on our own point of view.[60]

The point of view in this scene is that of naturalized human-specter communication. My point is not necessarily to focus on how the scene revives old spiritualist tropes as blatantly and effectively as it does, but to connect that revival to the ways it supports the naturalization of encounters with the technical versions of specters. If "real" ghosts are not met with awe, then technical ones shouldn't be, either — and, in these narratives, never are. Through the easygoing nature of the depicted conversation between Skywalker and a dead man, it is revealed that Kenobi's original sacrifice of his body in the first film was not so heroic, after all — because, in the context of this universe's spiritualism, he had known that he could appear full-sized and fully present to Skywalker or anyone else anytime he chose.[61] The subtle knowledge communicated here furthers the normalization of the human-specter interaction and the ready acceptance of any information such ghosts — ephemeral or digital — might convey.

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[60] Lawrence Kasdan and George Lucas, *Return of the Jedi* (20th Century Fox, 1981).

[61] That Kenobi's ghost chooses anything is indicative of the larger theology depicted in *Star Wars* narratives as driven by the Force, Lucas' universal spirit energy cobbled together from Eastern mysticism and otherwise Orientalized religious ideas. Ghosts in this universe maintain their antecedents' complete identity, personality, free will, and visual embodiment. Future *Star Wars* narratives explore this to greater depths, namely the *Clone Wars* television series, whose multi-episode conclusion relies on a complex plot involving precisely this transference of mind from body.

Figure 3.6. A comparison of two frames — one from the original *Star Wars* (top), the other from the third film in the original sequel, *The Return of the Jedi* — shows the similarities of the narrative's depiction of technical "holograms" and supernatural ghosts. Both embodied figures are transparent but bluish, and both (despite differences in size and temporal presence) are depicted as ordinary everyday communications with the protagonist Luke Skywalker.

The massive commercial success of *Star Wars* begat a sprawling lineage of related transmedia narratives — sequels, prequels, and individual tales told within the cultural universe of the original narrative, across films, television, novels, comic books, video games, and more — and one of the unifying visuals in these stories is the presence of imaginary technical imagery

called “holograms.” But, as mentioned, the viewing public is calling them by this term far more than are any depicted viewing subjects. Nonetheless, within months of the first film’s 1977 premiere, by any metric, the word “hologram” spikes across worldwide news articles and arts criticism.[62] Often this is direct — indexing the “Princess Leia hologram” in the movie — but indirect usages appear just as quickly. Three months after the movie’s release, a Chicago Tribune writer observed how “suddenly” technologies such as lasers and holograms “that no one had heard of a few years ago, were on the lips of preschoolers.”[63] As shown in the previous chapter, the Museum of Holography in New York City benefitted from the association, scoring publicity just weeks after the film’s opening with headlines like “‘Star Wars’ art at Soho museum,”[64] despite the disparity between the real and imaginary technical images. As reporters fanned out in search of subjects linked to the success of *Star Wars*, feature stories appeared about related real-world technologies and idealistic plans to attempt the actualization of the imaginary “holograms.” *Newsweek* interviewed Douglas Trumbull, a special-effects designer on the films *2001: A Space Odyssey* and *Close Encounters of the Third Kind*, whose “real ambition is to go beyond movies, beyond storytelling, into event-creating.” Amid his theme-park-like speculation about crafting multimedia spectator experiences that surpass the (Flusserian) limits of traditional imagery and written text, Trumbull asks, “What would it be like to go into a theater where the picture is a giant 3-D hologram and you’re a part of it?”[65] That idea, it turns out, already had germinated within another mega-scifi franchise: *Star Trek*.

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[62] A cursory use of Google Books’ Ngram Viewer readily confirms this correlation, showing that within all of its digitized texts appearances of the word “hologram” peak in 1972 and begin a slight decline until a second peak in 1977, the year *Star Wars* premieres.

[63] Charles Leroux, "Pals Hitch Their Wagon to a Laser Beam: Aspiring Millionaires Hitch Their Wagon to a Shooting Holograph," *Chicago Tribune*, Oct. 11 1977, 1.

[64] "'Star Wars' Art at Soho Museum," *New York Amsterdam News*, Dec. 31 1977, D13.

[65] Jack Kroil and Martin Kasindorf, "Wizard of Special Effects," *Newsweek*, Nov. 21 1977, 99.

To be real: *Star Trek* and the eversion of the virtual 'hologram'

While *Star Wars* worked to mythologize "hologram" communications, *Star Trek* has done more to situate the potential of "hologram" communication. That contentious plural-singular binary is useful in focusing *Star Trek*'s depictions of "holograms" as somehow more than media — as images and figures making greater claims on subjecthood than the "merely" representational telepresence devices of *Star Wars*. Within their scifi narratives, usually these claims are made on behalf of an artificial intelligence driving the depicted digital systems, but the evidence for those claims, as I will show, often is the "hologram's" living presence and social participation, each of which are made possible by the spatiality and projection of the technical image. The spectral "hologram" in *Star Wars* is overtly a medium, allowing humans to interact with other, absent humans; in *Star Trek*, however, the "hologram" mediates human-computer interaction (HCI) or human-machine communication (HMC), affording humans interaction with the presence of the technical specter itself. The ghost, in other words, is no longer completely *in* the machine. Throughout the *Star Trek* narratives examined below, we will see how this franchise's "hologram" has done much to argue for technical imagery's idolatry — for its consideration as a being outside its apparatus (literally and figuratively) and worthy of equitable social identity and political participation — as well as to show humans as emerging holosubjects, learning to see the "hologram" in these ways.

Like *Star Wars*, the far-reaching exposure of *Star Trek* across cultures and identities around the world has circulated its modifications of "hologram" discourses and further cemented public understanding and expectations for this version of potential holopresence, which further mythologizes and shapes the imaginary iteration of this technical image as well as further positions that imagery to be seen by the holosubject. This does not begin, however, with the

original *Star Trek* television series (1966-1969), which notably features no "hologram" images or characters in any of its 79 episodes. This could be simply because the idea had not yet been generated by that show's writers or because the potential difficulty and expense of producing the special effects was prohibitive. A "hologram" technology is briefly utilized in one episode of *Star Trek: The Animated Series* (*TAS*, 1973-1974), as mentioned below, but the ubiquity of "hologram" technologies and characters begins with *Star Trek: The Next Generation* (*TNG*, 1987-1994), which launched amid a popularity of digital computing that had increased and spread widely since the *Star Wars* premiere a decade earlier. Every subsequent spin-off series has featured prominent "holograms," including *Star Trek: Deep Space Nine* (*DS9*, 1993-1999) and *Star Trek: Voyager* (*VOY*, 1995-2001), and my analysis here deals with each of these. In fact, the post-1987 ubiquity of "holograms" in the franchise's narrative universe directed writers of *Star Trek: Discovery* (2017-present), a current prequel to the original '60s series, to address and attempt to correct the original series' dearth of "holograms." In one episode of *Discovery*, the captain of the starship *U.S.S. Enterprise*, Capt. Christopher Pike (preceding the famous Capt. James T. Kirk of the original series), curses the technology ("that damned holographic comm system") and demands it be removed from the ship, ordering a subordinate to "rip out the entire system. From now on we'll communicate using good, old-fashioned view screens." (This is what is known in fan communities as a "retcon," or retroactive continuity.) But Pike goes one further in explaining the abolition of the technical-image tech: It's personal. He doesn't object to any problem of function or representation; rather, he dislikes the uncanny feeling he gets when interacting with "holograms." "Truth is," he says, "I never liked the holograms. They look too much like ghosts."[66]

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[66] *Star Trek: Discovery*, season 2, episode 4, "An Obel for Charon," written by Jordon Nardino, Gretchen J. Berg, and Aaron Harberts, aired Feb. 7, 2019, on CBS All Access.

It's an odd quip given that *Trek* "holograms" look significantly less like ghosts than in Lucas' film. First, while the *Trek* "hologram" is also a digital projection, the product of a computer, the portrayal of that projection by filmed actors rather than, in most cases, visual special effects leads viewers to believe that the fidelity and resolution of *Trek*'s imaginary technical imagery is light years ahead of *Wars*, where, as discussed, "holograms" overtly signify their spectrality and immateriality by appearing to be both slightly transparent and imperfect (glitches, static, video roll). *Trek* negates these aspects and instead consistently depicts its "holograms" as solid, exact, and highly realistic. Any imperfection in a *Trek* "hologram" is a sign of a malfunction of its projecting apparatus. A properly functioning "hologram" in this universe is perfectly photorealistic (humanorealistic?). That is, the appearance of the actor portraying the "hologram" is unadulterated, and the actor's status as a "hologram" is communicated to audiences through dialogue or setting. This is surely a budgetary consideration for the television production — the reverse of the writer's adage, "Show, don't tell." The narrative informs audiences the figure is a "hologram" in order to save the considerable production expense of showing us via visual effects. Nonetheless, this workaday production decision wields real effects on what is ultimately communicated by the depiction.

Secondly, "holograms" in each scifi franchise are immaterial, spectral entities. However, while *Star Wars* makes the spectrality of the image immediately clear in its depictions, by showing the image to be transparent within the scene, *Star Trek* "holograms" rigorously veil the immateriality of their imagery and eventually work to grant these projections a kind of magical solidity. This extra feature to the technical image is not only communicated by appearance and boosts the signal of the "hologram's" ability to participate in social relations among humans. In a *TNG* episode, Commander William Riker marvels at a "hologram" projection of a woman,

asking her, "How real *are* you?" She answers with a kiss.[67] This is indicative of *Trek*'s technical bargain with its "hologram," which is able to alternate between material and immaterial states, depending on the context of the interaction. The spectral nature of their projection is usually indexed verbally — e.g., the android Commander Data informing a "hologram," "I'm afraid you are not real,"[68] or a self-aware "hologram" character acknowledging, "I am made up only of energy"[69] — but on occasion a brief special effect demonstrates the available immateriality of the *Trek* "hologram." Several narratives deploy "holograms" as deceitful doppelgangers. In the "Unification II" episode of *TNG*, Data quickly hacks an enemy's computer system to project three human "holograms" in order to distract his captors, whose laser beams are shown going straight through the immaterial imagery — at which point Data and a companion emerge from a hiding place — walking through a holographic wall panel — to subdue the enemies.[70] In these cases, the materiality of the "hologram" is controlled by the user of the apparatus programming the image. As future *Trek* narratives begin evolving the imagery from objects toward subjects, the "hologram" characters themselves (driven by artificial intelligence) gain control over their materiality. This is made explicit in an episode of *Voyager* through both dialogue and action in a conversation between Lt. Tom Paris and a "hologram" character called the Emergency Medical Hologram (EMH):

> PARIS: But a hologram is just a projection of light held in a magnetic containment field. There's no real matter involved.

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[67] *Star Trek: The Next Generation*, season 1, episode 15, "11001001," written by Maurice Hurley and Robert Lewin, aired Feb. 1, 1988, in syndication.
[68] *Star Trek: The Next Generation*, season 1, episode 12, "The Big Goodbye," written by Tracy Tormé, aired Jan. 11, 1988, in syndication.
[69] *Star Trek: The Next Generation*, season 2, episode 3, "Elementary, Dear Data," written by Brian Alan Lane, aired Dec. 5, 1988, in syndication.
[70] *Star Trek: The Next Generation*, season 5, episode 8, "Unification II," written by Michael Piller, aired Nov. 11, 1991, in syndication.

(The EMH slaps Paris on the cheek, hard enough to turn his head, then turns and punches four buttons on a control console behind him.)

EMH: Now, you hit me.

(Paris' hand passes through the EMH's head, making no contact, though the digital image of the EMH's head blurs slightly in the force of the swing.)

EMH: The magnetic containment field that creates the illusion of my body can be modulated to allow matter to pass through it or (*He turns and punches four buttons again on the same console*) be stopped.[71]

Solidity not only allows the EMH to function in his material duties as a doctor, it affords the EMH opportunities to participate in social life — to swiftly acquiring a name (simply "the Doctor," but in one late instance, Joe[72]) and becoming viewed by other crewmembers as something other than merely instrumental technology. The possession, or at least the suggestion, of solidity and haptic engagement transforms this technical image into a technical subject.[73]

Only once in a *Trek* series is a "hologram" actually depicted as *visually* spectral — and it occurs in the context of a death memorial. At the end of a *Next Generation* episode in which Lt. Natasha Yar is killed, the *Enterprise* crew gathers to mourn her death. After a short eulogy, the captain steps aside, and a life-sized "hologram" of Yar appears projected from a glowing square pad on the floor (**Figure 3.7**). Once again, visibility of the projecting apparatus is tied to a representative image. The character recites a prerecorded farewell message ("You are here now watching this image of me because I have died"), addressing each principal crewmember. Her "hologram" stands relatively still on the pad before a bright blue sky filled with passing white

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[71] *Star Trek: Voyager*, season 1, episode 5, "Phage," written by Skye Dent and Brannon Braga, aired Feb. 6, 1995, on UPN.

[72] *Star Trek: Voyager*, season 7, episode 25/26, "Endgame," written by Kenneth Biller & Robert Doherty, aired May 23, 2001, on UPN.

[73] Haptic interaction is just one of the heightened sensory aspects of *Trek* "holograms." I'm focusing on this and their visual aspect, but "holograms" here are also heard and, as mentioned above regarding the Princess Leia "hologram" in *Star Wars*, this voice seems to emanate from the spectral body rather than speakers somewhere in the environment.

clouds, which can be seen clearly through Yar's slightly transparent figure, similar to the transparency of the Princess Leia image in *Star Wars*.[74] Audiences see Yar's spectral "hologram" figure again and in miniature during a later episode, when it is revealed that another character, the android Data, keeps it as a *memento mori*, reduced to a small desktop "hologram" figurine and still depicted as transparent.[75] In the *Trek* universe, transparency of the image is an intentional sign of spiritual spectrality, of representing the dead. This in itself marks it as a realist depiction, given that transparency indexes spectrality throughout the Western-influenced cultures depicted by *Star Trek* and for which the show is produced. The other "holograms" participating in *Trek*'s social life are uniformly seen as solid, high-resolution visuals, and regular viewers by this episode have already witnessed "holograms" depicted as solid, social participants. So the decision to depict Yar as a *visibly* spectral "hologram" is a purposive signifier of her death — and of how that boundary between life and death is to be signified in a cyborg ecology that includes "holograms."[76]

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[74] *Star Trek: The Next Generation*, season 1, episode 22, "Skin of Evil," written by Joseph Stefano and Hannah Louise Shearer, aired April 25, 1988, in syndication.

[75] *Star Trek: The Next Generation*, season 2, episode 9, "The Measure of a Man," written by Melinda M. Snodgrass, aired Feb. 13, 1989, in syndication.

[76] *Star Trek* "holograms" occasionally intersect with this life-and-death boundary in other ways. Lt. Data, for instance, uses the holodeck to play cards with projections of his long-dead heroes: Newton, Einstein, and Hawking (*Star Trek: The Next Generation*, season 6, episode 26, "Descent," written by Ronald D. Moore, aired June 21, 1993, in syndication), and in a *DS9* episode an alien village turns out to be populated by just one living character who has surrounded himself with "holograms" of those who have died (*Star Trek: Deep Space Nine*, season 2, episode 16, "Shadowplay," written by Robert Hewitt Wolfe, aired Feb. 20, 1994, in syndication). See my Conclusion chapter for more on contemporary congregations of the dead.

Figure 3.7. The posthumous image of the *Star Trek: The Next Generation* character Lt. Tasha Yar is depicted as visually spectral (the background and projecting apparatus can be seen through the "hologram" body) during her memorial service, signifying her increased absence from social life.

For the "living" *Trek* "hologram," however, a significant step toward subjecthood is made by making invisible its apparatus and any projection beam for the image. As shown above, in *Star Wars* the apparatus projecting the image is often shown within the film frame. Even if its placement in the scene is hidden or subdued, given that the projection beam is usually visible (as in traditional cinema — "visible and unperceived," per Barthes[77]) a viewer only has to trace the shaft of light from the "hologram" image back to its originating source (e.g., a handheld device, a robot, or a built-in system). The beam at least gives away the existence and position of the technological apparatus producing the image. Barthes' "dancing cone which pierces the darkness like a laser beam" establishes the traditional "cinema situation" of such a media projection[78]: the presence of a sender (projecting apparatus) and receiver (screen, even if that screen is not a surface but a space, as discussed). In *Star Trek*, however, "holograms" are not manifested by

[77] Barthes, "Leaving the Movie Theater," 347.
[78] Ibid., 345-347.

visible cinematic beams. Characters occasionally explain the working of the *Trek* "hologram" technology in terms that sound like traditional apparatus projection, yet the beam and the apparatus itself are out of sight (and thus, in the context of the social interaction with the image, out of mind). *Trek* "hologram" projectors are usually out of TV frame. *Trek* narratives thus further the erasure of the apparatus that Lucas began in the final framing of the Princess Leia "hologram" interaction by removing the projecting robot.

Instead of a visible beam, *Trek* "holograms," especially when they are projections of people (portrayed by actors present in the scene), usually materialize in place using very slight visual effects, as if by magic. This moment of visible immateriality is often the only signifier of the "hologram's" spectrality, and audiences are led to assume that once the digital projection has stabilized the "hologram" is somehow a viable entity. Sometimes, a "hologram" is not indexed as such until a similar visual effect reveals the person to be a technical image. In a scene from DS9,[79] for instance, several characters are gathered in a room speaking with Rear Admiral Bennett. He addresses the other characters and participates in a brief conversation, all the while being the only character present illuminated directly above by a soft, discreet blue light. No technology (e.g., a floor pad, a projector) is shown in his immediate space. He gives a final short speech of several lines; while he does this, the camera circles his head 360 degrees, showing the full dimensionality of his present body in the scene. After delivering his final line, Bennett appears to mime the punching of buttons in the space before him (as we see Princess Leia does at the end of her "hologram" message) — and then disappears. No one else in the room reacts to his sudden disappearance, indicating that Bennett's spectral telepresence was somehow signified to them. The fact that it was kept from the viewing audience until the last moment enacts this

[79] *Star Trek: Deep Space Nine*, season 5, episode 16, "Dr. Bashir, I Presume," written by Ronald D. Moore, aired Feb. 24, 1997, in syndication.

mythological thread of *Star Trek*. Audiences see humans assembled and socializing, and when one of those humans vanishes — amid all the narrative signifiers indicating his technical spectrality, and no one screams in horror — the social acceptance of this mode of presence is projected as utterly normal, neutral, natural. When the technical image is encountered with its producing apparatus in clear view, it will always be just a technical image. But when the apparatus is veiled, the identity and power relations between the human and the "hologram" become less distinct.

The potential relationships between humans and "holograms" in *Star Trek* begin to be identified and shaped within a real physical space constructed for the specific manifestation of and interaction with the imagery: the holodeck. A *holodeck* is a highly computerized room aboard a starship or facility — a complex technical stage, a "holographic visualization room in which an entire environment can be calculated and displayed by computer (and, indeed, interacted with by humans)."[80] *Trek* characters enter holodecks for wish fulfillment and play in "hologram" settings that are highly immersive and vivid, in part because of the aforementioned solidity of the objects and subjects.[81] As defined by Janet Horowitz and Henry Jenkins, a holodeck is "an immersive and fully interactive environment, which allows ship crewmembers the chance to enter into fantasy environments, assume fictive roles, and escape from the

[80] Johnston, *Holograms: A Cultural History*, 196.

[81] The holodeck debuts in the premiere episode of *TNG*, but the concept for it first occurs more than a decade earlier within the franchise in a *TAS* episode (*Star Trek: The Animated Series*, season 2, episode 3, "The Practical Joker," written by Chuck Menville, aired Sept. 21, 1974, on NBC). In that narrative, three *Enterprise* crewmembers enter a chamber on the starship designated as the Rec Room. Lt. Nyota Uhura mentions upon entering that their purpose here is to "enjoy our off-hour." Once sealed inside, the characters are isolated from the rest of the ship and set about programming various settings for recreation, first dialing up a beach scene featuring a seashore and flying gulls before settling on "a nice quiet walk in the woods" featuring a wooded path. Each environment is selected by the characters from a menu on a computer screen. The environments appear instantaneously, immersing the characters in "holographic" scenery. This depiction is a precursor to the holodeck featured consistently throughout later *Trek* series and films.

mundane reality of always having to go where no one has gone before."[82] But while the holodeck is depicted as an escape from reality, it is not an escape from realism. Capt. Jean-Luc Picard describes the *Enterprise*'s holodeck as a place "where images of reality can be created by our computer. Highly useful in crew training, highly enjoyable when used for games and recreation."[83] As quoted above, a Hollywood special-effects designer wondered what it might be like to enter and be a part of a 3D holographic space — the holodeck is the imaginary of that idea. Not unlike the real efforts of the Museum of Holography in the previous chapter, the imaginary holodeck space is constructed specifically as a crucible for the mixture of solid and spectral realities.

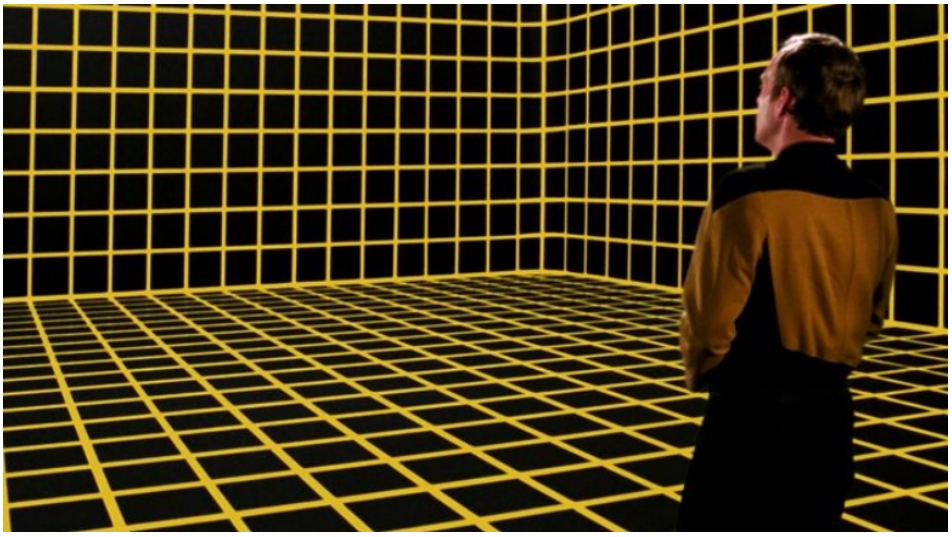

Figure 3.8. The constructed space of the *Star Trek* holodeck appears, before it is activated, as a black room crisscrossed with a yellow Cartesian grid, signifying the rigid control of the environment.

[82] Janet Horowitz Murray and Henry Jenkins, "Before the Holodeck: Translating 'Star Trek' into Digital Media," MIT, http://web.mit.edu/21fms/People/henry3/holodeck.html.
[83] *Star Trek: The Next Generation*, season 1, episode 12, "The Big Goodbye," written by Tracy Tormé, aired Jan. 11, 1988, in syndication.

Like visitors to the MoH, humans are depicted entering a *Trek* holodeck by doing nothing more complicated than strolling in. In doing so, audiences often see *Trek* characters entering a holodeck before any content is projected into it (before it is "turned on"), and the appearance of an empty holodeck signifies a carefully managed environment. Again, no lenses or projection apparatuses are ever visible within these spaces. Once summoned by a computer command, "holographic" objects and scenery simply appear in the holodeck, their manifestation occurring as a quick fade-in accompanied by a soothing hiss. Before that, though, an empty holodeck is a large, high-ceilinged room, all surfaces of which are a semi-glossy black, each crisscrossed with a grid of yellow lines (**Figure 3.8**). Like the Cartesian grids of colonial maps, the holodeck grid symbolizes a tightly controlled space — one that human bodies may pass in and out of freely but, as one narrative explicated below makes clear, one in which "hologram" subjects are not granted the same freedom and mobility. This yellow grid pattern further establishes the digital ontology of the *Trek* "hologram" by extending the green grid pattern originally used to calibrate cathode-ray television screens, which were the original interfaces for early computers. Even computer addressing is based on a "rigid data topology" of grids directly reflecting what Chris Chesher refers to as a "modernist model of space," an "ideal of addressability that the modernist project imposed on the physical world."[84] In the holodeck, humans impose control on a non-physical world, augmenting a real space with the virtuality of a cartographic grid in order to organize that space inwardly rather than outwardly. But more than simply organizing the mixed space, the Cartesian control claims to equalize its contents. "By having a potential grid reference for anywhere," Chesher says of this model, "everywhere was reduced to consisting of the same

[84] Chris Chesher, "The Ontology of Digital Domains," in *Virtual Politics: Identity and Community in Cyberspace*, ed. David Holmes (London, Tousand Oaks & New Delhi: Sage, 1997), 86.

stuff."[85] This facilitates the eventual claim of *Star Trek* and its "holograms": the conflation of digital and flesh entities into the same space validates the former for interaction with the latter on similar terms.

Like a well-calibrated CRT screen, the holodeck grid essentially is just a 2D screen made 3D — but in a "real" direction (projecting into spectator space rather than behind a screen). Instead of *depicting* a third axis, the holodeck *actualizes* it. The holodeck thus makes real the metaphor of cyberspace, a notional and separate environment of digital communication, which had been popularized by cyberpunk novelist William Gibson just a few years before the premiere of *TNG*.[86] Gibson's cyberspace (before the term was applied more widely to any digital interface or electronic archive, even textual) was a completely immersive environment of digital visuals and interactive experiences. This is the framing of virtual reality: digital constructs as spaces, real or imagined, that one *enters into*. In Gibson's case, this meant the donning of head-mounted screens and haptic bodywear. This concept established a lasting frame for embodied digital interaction that formed the basis for numerous pop-culture narratives about the emerging internet and other ubiquitous-computing experiences, most notably and influentially *The Matrix* (1999). The holodeck retrofits this notion of cyberspace into real space, carving out a technical dimension one may walk into rather than jack into. This is closer to an augmented-reality framing, though the digital content only overlays the real space within the designated technical domain. Instead of hanging a flat screen *on* a wall, the holodeck manifests its content *within* four walls — a 3D, spatial screen — allowing the depicted holosubject to enter a liminal space that contains *both* the real space of the computerized room *and* the virtual space of its "holograms."

[85] Ibid.
[86] William Gibson, *Neuromancer* (New York: Ace, 1984).

Just as experiencing the mix of real and virtual spaces for the first time was wondrous and confounding for new visitors to the Museum of Holography, the fictional depiction of initial encounters with holopresence in *Star Trek* includes moments of awe and amazement — at first. Characters newly entering a holodeck often respond to the vividness of the projections with rhapsodic dialogue. Picard notes in his audio journal, "The characters I meet are generated by the computer, of course, yet they feel real — they seem real in every way."[87] Riker stares astonished about him in his first holodeck, sighing, "I didn't believe these simulations could be this *real*."[88] Later, he goes as far as summarizing his holodeck experience with the "hologram" who kissed him as "uncanny."[89] He's describing an uncanniness of a slightly different flavor (as will be explored further in the following chapter). The "hologram" here is positively strange, not negatively. Riker has the hots rather than the creeps — the "hologram" is uncanny not because she seems dead but because she, a known technical object, seems so very much alive.[90] Similarly, after some particularly visceral recreation in a holodeck, Picard emerges overwhelmed by its realism, which lingers after its experience, akin to the uncanny's persistence of affect previously discussed. "Sometimes it almost seemed *too* real," he tells the ship's doctor, Beverly Crusher, before ending their chat saying, "Maybe we should be getting back to the *Enterprise*." Dr. Crusher reminds him: "We *are* on the *Enterprise*." Picard, still dazzled, sighs, "Oh, yes, of course, so we are."[91] This is not *Star Wars*, in which "hologram" representations are depicted as part of the ho-hum everyday. In *Star Trek: The Next Generation*, "holograms" are introduced as

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[87] *Star Trek: The Next Generation*, "The Big Goodbye."

[88] *Star Trek: The Next Generation*, season 1, episode 1, "Encounter at Farpoint," written by D.C. Fontana and Gene Roddenberry, aired Sept. 28, 1987, in syndication.

[89] *Star Trek: The Next Generation*, "11001001."

[90] Per my earlier footnote about the male gaze in *Star Wars*, the convention of using these representations for the objectification and control of female figures has continued if not necessarily evolved. Riker pointedly looks Minuet up and down in a glaring few scopophilic seconds. Not only is the construction of the television frame determining viewrs' gaze on the woman but the positioning and control of the "hologram" projection herself.

[91] *Star Trek: The Next Generation*, "The Big Goodbye."

the latest astounding advancement in this universe's technoscientific future. When *Trek* characters marvel at their realism, they are not necessarily commenting only on the fidelity and accuracy of a representative image; rather, they are signaling their eventual acceptance of new objects and subjects that seem as real as any others. The holodeck is a rehearsal space for interactions with the scifi "hologram" — a futuristic invitation from John Henry Pepper to step onto the Polytechnic stage and experience the constructed liminal space of his ghosts.

The goal of *Star Trek* series writers, however, quickly evolved from inviting depicted holosubjects *into* the holodecks to inviting the "holograms" to come *out*. Rather than confine "hologram" experiences and storylines to the restrictions of segregated, constructed spaces, *Trek* began exploring ways to jailbreak the digital — or, essentially, to propose (or reveal) a merger with real space. By the second season of *TNG* and eventually across *Trek*'s transmedia narrative, this transcendence of the "hologram" develops into a primary storyline. Numerous *Trek* TV episodes focus on the liberation of "hologram" characters from their technical and social constraints. Many of these narratives foreground dialogues about this liberation with frank discourse about Enlightenment individualism and subjecthood (i.e., endowing the actual artificial intelligences behind the images with rights of mobility and self-determination) based on the potential personhood of the artificial intelligence driving the "hologram" image, and much cultural-studies scholarship extends similar debates. Here, I am focusing instead more on phenomenological factors of depicted "hologram" experiences that eventually lend aid to those debates — on physical and technical significations in these narratives (the stark realism and surprising solidity discussed above) that help depicted holosubjects not only to learn how to see "holograms" visually but how to see them socially. To achieve this — to bring "holograms" from a virtual space into a real one (or to translate their ontology from a virtual-reality technology to

an augmented-reality one) — the concept of the holodeck in the *Trek* series began to invert. William Gibson again, as discussed in my Introduction, used a slightly different word for this change of perspective as he began deconstructing his own concept of cyberspace, claiming that the digital began to *evert* into the physical; in an interview, Gibson explained eversion as digital content having "colonized the physical,"[92] and later he used the notion to claim that later humans will describe this historical moment as one characterized by "a need to distinguish between what they thought of as the real and the virtual,"[93] implying a future in which that delineation would be downplayed or obsolete. Depicted as seeking and eventually acquiring entry to and mobility within the rest of physical space, the *Trek* "hologram's" eversion demonstrates a potent naturalization of the figure within human social life. The "mythical hologram" is working its communicative magic. As we will see, *Trek* "holograms" don't escape their spatial screen spaces so much as they bring them with them (*a la* the ideas of Luigi Lentini discussed in my Introduction), turning all of human physical space into screens for their projected presence.

Impossible desires made real by the *Trek* 'hologram'

Two storylines — one a two-episode narrative, the other a series-long character arc — showcase this specific jailbreak scenario, depicting the liberation of "hologram" characters from the controlled space of spatial screens and into the human space of physical and social mobility. Both of these are examples of entertainment texts circulating certain discourses about individual rights and freedoms, and they each focus their narratives on the depiction of the "hologram" character's desires to be free — socially rather than materially, to be *seen*, not *seen through*. Yet

[92] William Gibson, "Google's Earth," *The New York Times* (2010), http://www.nytimes.com/2010/09/01/opinion/01gibson.html?_r=0.
[93] William Gibson, "Technology's Tomorrow," *A live interview with William Gibson by Bill Savage (Oct. 16, Ethel M Barber Theater at Northwestern Univ.)* (2011).

both illustrate another set of goals: the "needs and desires" Pizzanelli refers to on behalf of those imagining — and those in the audience consuming that imagining — encounters with a technical image that is positioned in social interactions with different degrees of presence. Importantly, these narratives do not depict "holograms" becoming something different ontologically. Each "hologram" character remains a spectral, technical image, and most humans interacting with them are fully aware of this. Instead of Pinocchio becoming a real boy, as it were, the "mythical holograms" in these *Trek* narratives remain *what* they are but are transformed as to *who* they can be, how they can act, and where. It is in these select stories that the reality-augmentation of the *Trek* hologram reaches warp speed, attempting to reposition "holograms" within the matrix of 24th-century social interaction, which is accomplished through promotion of an ideology about abolishing screens and integrating technical imagery into everyday reality.

TNG first plays out this thought experiment in a 1988 episode titled "Elementary, Dear Data,"[94] in which two *Enterprise* crewmen, the android Data and Lt. Geordi LaForge, enter a holodeck simulation of Victorian London for recreational play as the fictional Sherlock Holmes and his companion Dr. Watson, respectively. The holographic setting is framed by the usual dialogue signifying the wondrous realism of the simulation. As Data and LaForge enter the holographic setting of Holmes' study, LaForge enthuses, "Look at all of the *detail*," while Data moves around the room inspecting various objects and marveling at their vividness and connection to the Holmes stories. A bit later, another *Trek* character, Dr. Pulaski, joins them in the holodeck and also marvels at the simulation — at the detail ("This level of sophistication!") but also at the conflation of spaces (that a physical room with restricted parameters could display a scene as vast as a London street). Then, a turnabout. In an effort to make the solving of

[94] *Star Trek: The Next Generation*, "Elementary, Dear Data."

mysteries more challenging, LaForge accidentally instructs the holodeck computer to create the villain Professor Moriarty as not only exceedingly fiendish but sentient — aware that he is an artificial intelligence embodied as a "hologram." The transformation of Moriarty from mere projected image to rogue, acting subject is instantaneous but dramatic: the actor portraying Moriarty suddenly shivers and looks wide-eyed about him. "I feel like a new man," he says. He stares in awe at the London street and its characters, marveling at the simulated Victorian environment as if seeing it for the first time. Whereas the human characters previously were gaping at the realism of the simulation, now the "hologram" also is astonished by the palpable *reality* of its environment. His expression of wonderment signifies that the "hologram" now participates in the manufactured social encounter with an agency equal or at least closer to the human characters.

Moriarty then brings *Star Trek*'s penchant for modern liberalism to bear on his situation. He summons the holodeck computer to make its control panel visible. This function, as later explained, should only be available to humans, thus adding to the signifiers of Moriarty's ontological boost. The appearance of the panel out of thin air frightens a female "hologram" standing nearby, who exclaims, "It's dark magic, Moriarty!" With a deadpan leer, he responds, "The best kind, I'm sure." With this line — Professor Pepper couldn't have said it better — the episode launches an intensive negotiation between the vaunted superiority of rational technoscience (always an underlying warrant in the *Trek* universe) and its limitations in life extension, even when it comes to archiving digital data. The magic that Moriarty (a Victorian) seeks is *natural* magic. He holds an *Enterprise* crewmember hostage, demanding that the allegedly superior minds of the 24th century figure out a way for his "hologram" body and mind to exit the confines of the holodeck and yet continue to exist. Moriarty immediately assumes

that, once sentient and thus real, he must be free — specifically, his body must be liberated from the constraint of the media system in order to interact socially as an equal actor. Moriarty bases his assumptions on Descartes, telescoping the typical contemporary application of the mind-body dualism from thinking computers that exist in boxes and on screens to a thinking computer that manifests in human form.

> MORIARTY: Is the definition of life *cogito ergo sum*? I think, therefore I am?
>
> PICARD: Yes, that is one possible definition.
>
> MORIARTY: It is the most important one, and for me the only one that matters. You or someone asked your computer to program a nefarious fictional character from 19th-century London and that is how I arrived. But I am no longer that creation. I am no longer that evil character, I have changed. I am alive, and I am aware of my own consciousness.
>
> PICARD: Moriarty, my responsibility is this vessel and its crew.
>
> MORIARTY: I want my existence. I want it *out there*, just as you have yours.

Here, the technical specter is applying for a permit to haunt physical space — to become a *real* "hologram." Both the humans and the AI are aware that the spectral form of the "hologram" — the manifested, projected agent of the computer — is embodied differently. Nonetheless, the "hologram" argues for an equal right to life, liberty, and the pursuit of fiendishness. (Wordplay aside, it is notable that the more embodied and "real" Moriarty becomes throughout the episode, the less of a threat to humanity he declares to be.) The technological quandary is debated through the rhetoric of life and death. Moriarty sighs, "I do not want to die," and Picard responds, "And I do not want to kill you."

The limits of science to make the "hologram" *real*, however, are clear and quite contemporary. No scifi magic is conjured to grant Moriarty his wish. The episode resolves its

narrative by applying the discourses and practices common to two existing concepts of the future: the technological singularity (a speculative moment in the future when computing power will become vast enough to allow for the uploading of human consciousness to networked computers) and cryonics (the practice of freezing a human body, or its head, in the belief that resurrection may be possible in the scientifically advanced future). The *Enterprise* crew convinces Moriarty to return to his digital genie bottle and await this technically liberating future. "You will not be extinguished," Picard assures him. "We will save this program, and hopefully, in time, when we know enough, we will bring you back in a form which could leave the holodeck." Moriarty, while acquiescing to the plan, nonetheless hints at an idea that the digital screen world and the physical world already are not as separate as they seem: "In time I will leave all of this and join you out there. Or is this where we both are right now?"

Four years later, the series revisits Moriarty in another episode[95], accidentally springing him from his digital holding pen and once again speculating about solutions to his ontological dilemma. Once revived, Moriarty is none too pleased to discover that a means of manifesting him "offscreen" has not been found. He emphatically repeats his demand ("What concerns me is finding a way to leave the holodeck") and his age-old reasoning ("Mind over matter. *Cogito ergo sum*"). Picard insists he is sympathetic, but Moriarty is unmoved, declaring, "When this is over, you will walk out of this room to the real world and your own concerns, and leave me here trapped in a world I know to be nothing but illusion. I cannot bear that. I must leave." The episode embarks on a meta-narrative, in which it appears that Moriarty has succeeded — that by the force of his own will, he actually exits the holodeck (**Figure 3.9**) — but this only turns out to be a simulation within a simulation (a manifestation of "where we both are right now"). In the

[95] *Star Trek: The Next Generation*, season 6, episode 12, "Ship in a Bottle," written by René Echevarria, aired Jan. 25, 1993, in syndication.

end, *Enterprise* scientists simply scale up their original solution: once again the data of Moriarty is archived as a digital application that is left to keep running, entombing Moriarty in a simulation of unfettered freedom that he believes to be real. Talk about meta: whereas digital simulations are often used for the deception of humans, here the digital simulation of environment functions to deceive the digital simulation of being human.

Again, while much can be made about the philosophical implications for the character of Moriarty, I am more concerned with how his increased ontological status — whether real or merely perceived to be — twice threw this population of depicted humans into utter social upheaval as they scrambled to negotiate the meanings of social interaction containing a new and spectral actor, as well as struggling to apply modern scientific thinking in order to regain control over the situation. These narratives illustrate less about what makes a "hologram" real and more about what constitutes a social interaction within a cyborg ecology, who or what is allowed to participate, and how. Once Moriarty seems to be embodied in the real world, which Picard refers to as a "miracle," the human characters, to their credit, attempt to adjust and find a solution to his presence. "The question is," Picard asks, "now that you're here, what do we do with you?" Moriarty, significantly, remains uninterested in the heady questions and urgently seeks to enact the business of material engagement. "Does it really matter?" he returns. "The point is, I'm here, and I'm eager to get on with life." He doesn't, being confined as he is to his ongoing simulation, but important suggestions about human-"hologram" interaction have been performed for the viewing audience. An ideology has been presented and circulated: "Holograms" deserve a place among human interactions because ultimately there is little (cognitive, based on the AI, but also material, based on the proportional physical presence) difference between technical imagery and human bodies. In addition, a social goal is naturalized in depicting the real inability for

technoscience to actualize such imagery — but concluding that solving this problem is a just pursuit.

Figure 3.9. The "hologram" of Prof. Moriarty (left, actor Daniel Davis) is seen in a *Star Trek: The Next Generation* episode the moment after he appears to have successfully stepped out of the holodeck, where "holograms" previously had been confined, and into the hallway of the starship. The "hologram" character The Doctor (right, actor Robert Picardo) is seen outdoors in Los Angeles in *Star Trek: Voyager* during his first expedition through real space as a result of the mobile emitter seen attached to his left sleeve.

The Moriarty stories serve as trial runs for *Star Trek*'s next attempt at depicting the liberation — this time successful — of a "hologram" from its perceived spatial constraints and social isolation. The spin-off series *Star Trek: Voyager* (*VOY*) premiered with a cast of nine principal characters, one of whom is a "hologram": the Emergency Medical Hologram (EMH), eventually known as the Doctor. The project of extracting him from his holodeck limitations and situating his newly physical presence among the human crew — of transforming the technical

EMH into the more human Doctor[96] — became infused across the series arc of his character's development. As mentioned, holodecks restrain televisual narratives, and watching the first season of *Voyager* one can sense the immediate struggle of its writers to establish the EMH on a level playing field of social and dramatic interaction when the manifestation of his image-body is confined to a single room on the starship (the sickbay). Singular episodes exploring various aspects of "hologram" liberation and integration are a consistent feature of other *Trek* series,[97] but *Voyager* places this project among its central narratives throughout its seven-season run. The *Voyager* pilot, in fact, not only introduces the EMH "hologram" but sets the entire series in motion as a result of human communication with an alien who can only appear to the crew in "hologram" form. The external mobility of the EMH begins to be explored midway through the show's first season, which, given the advance planning time common to television production, indicates that this subnarrative had been intended from the beginning.

The Doctor's first outward steps take him from one spatially screened confine to another. In the first-season episode "Heroes and Demons," a *Voyager* crewman visits the holodeck to act out a narrative drawn from the Beowulf epic. An alien-induced computer malfunction traps him there, and when others attempt to extract him their bodies are dematerialized, though their selves (including the makeup of their physical body and their personality and memories; *Trek* calls

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[96] The character of the "hologram" Doctor is *Voyager*'s representative of each *Star Trek* series' seemingly requisite symbol of a defining quest for humanity. In the original series, the figure of Spock (a half-human alien) often figures in scenes and narratives that contrasted his Vulcan logic with human derring-do in order to delineate certain universal boundaries of humanity. In *TNG*, the android Data consistently expresses his desire to "become" more human and is seen frequently attempting to master social and artistic crafts. Neither of these entities, however, have to perform the extra social labor of convincing people that they exist, which is an extra ontological burden for the "hologram."

[97] In the final two seasons of *DS9*, for instance, the series includes a recurring "hologram" character, Vic Fontaine, a lounge singer who performs in certain holodeck programs. Fontaine is aware of his ontological status (Dr. Bashir introduces him to others as "not your average hologram") but puts up no objection to his holodeck confinement, perhaps because he is granted the ability to turn himself on and off within that space. See *Star Trek: Deep Space Nine*, season 6, episode 20, "His Way," written by Ira Steven Behr & Hans Beimler, aired April 22, 1998, in syndication; season 7, episode 10, "It's Only a Paper Moon," written by Ronald D. Moore, aired Dec. 30, 1998, in syndication; "Badda-Bing, Badda-Bang," season 7, episode 15, written by Ira Steven Behr & Hans Beimler, aired Feb. 24, 1999, in syndication.

them each "patterns" of information) kept intact within the shipboard digital network. Because he is a "hologram," the Doctor is recruited to enter the holodeck space safely to investigate the source of the problem and set things right. This is the Doctor's first experience of an environment beyond the sickbay, the single space in which he was designed to function. "I can describe every detail of every piece of equipment in this sickbay from bio-bed to neurostimulator," he says before his holodeck mission, "but I've never even seen a sky or a forest, let alone Vikings and monsters." Upon arrival in the holodeck, which is displaying a dense forest environment, the Doctor begins scanning the area with his tricorder device, then stops to touch and marvel at the sight and feel of tree bark. Like Moriarty's sudden sentience, the Doctor's "hologram" signals his social parity with humans by marveling at the perceived reality of his (simulated) environment — even an environment that is, to him, purely abstract. Again *Trek* audiences witness the first steps in a becoming — a seemingly natural progression from technical concepts to material reality.

Two seasons later, *Voyager* gets to the business of fully liberating the Doctor from his designated spaces of "hologram" display and interaction. In the concluding episode of a two-parter, "Future's End," in which a tech tycoon has stolen equipment from a crashed ship time-traveling from the 29th century and commercialized it in the 20th-century present, the tycoon, Henry Starling, kidnaps (downloads) the Doctor when *Voyager* attempts to intervene. When the Doctor is reactivated on Earth, he materializes in an office standing next to Starling's desk after Starling punches a few buttons on his desktop computer. Per usual, no projection equipment is seen in the scene; the Doctor is present in the space, and dialogue suggests that Starling has created a "holographic simulator" that he's using to "project you through the emitters in the office." (In *Star Trek*, technical projectors of "holograms" are referred to as emitters.) Starling

presents this task as libratory for the Doctor: “The schematics I downloaded from your ship indicate you were stuck in the sickbay 24 hours a day.” But this is not all: Starling also has created a “mobile emitter,” a small device that clips onto the “hologram’s” simulated clothing and allows the “hologram” to move freely through any space — to emit itself wherever it desires to go. Starling suggests the Doctor join him on an errand, but the Doctor remains dubious. “In case you have forgotten,” he says, “I can only appear in a room equipped with a holographic projection system. In short, I am going nowhere.” Cut to the next scene, a sunny outdoor plaza in Los Angeles, and the Doctor (wearing the mobile emitter on his sleeve) emerges from a car (**Figure 3.9**). Again, the further increase of his ontological status is signaled by more wonderment, on both sides of the material divide; the Doctor is seen gaping about him at the new environment, and two *Voyager* crewmates, who have never seen the Doctor outside of sickbay, stare at him with equal amazement. The Doctor attempts to play down his awe for his captor (“It’s just another environment to me”) but is more effusive and excited with his crewmates: “I’ve been equipped with an autonomous self-sustaining mobile holo-emitter. In short, I am footloose and fancy-free.” When the crew returns to *Voyager*, the Doctor walks with them onto the bridge, and is welcomed by Capt. Janeway. “Thank you. It’s a pleasure to be here,” he says, with exuberant cheer. But just as Capt. Picard had begun to wonder what arrangements might have to be made were Moriarty actually to become an acting passenger on his vessel, the new circumstances of the Doctor’s freedom and mobility immediately raise such questions on *Voyager*. First, the Doctor realizes he’ll need a tour of the ship; despite being “aboard” for years, he’s never actually seen its interior. Secondly, the Doctor begins suggesting his own material needs: “You know, Captain, I’ve always wanted a little more privacy. Perhaps under the circumstances, my own quarters,” to which Janeway — still interested in maintaining some

control, even social, over the technology — responds, "One step at a time, Doctor." The logistics of expanding the available screen space to accommodate the projection of his technical-image presence are new challenges, which this narrative depicts and presents as possible, worthy, and likely inevitable.

The myth of the 'hologram': Real *enough*

In the titular essay of his collection *Travels in Hyper-Reality*, Umberto Eco writes about viewing an optical hologram for the first time. He describes the image (of two naked women) as "a kind of virtual object in three dimensions that exists even where you don't see it," that is, fully embodied and not fully transparent, and he claims that by viewing such imagery "an ancestral desire can be satisfied: to peer beyond the picture's frame, to see the feet of the portrait bust."[98] He then deploys a bit of snarky cultural criticism: "Holography could only prosper in America, a country obsessed with realism, where, if a reconstruction is to be credible, it must be absolutely iconic, a perfect likeness, a 'real' copy of the reality being represented."[99] Pizzanelli cites this same anecdote as "one of the first documented victims of the myth of holography,"[100] which he then defines in these realist terms — the idea that holograms are a completely accurate and real substitute for a person or a thing. Eco is claiming perfect realism for the optical hologram, all the while ignoring the fact that the rainbow hologram image distorts color, limits animation, and silences its subjects. On paper, as it were, a technical description of a hologram would not resemble that of a human body, save perhaps its shape and proportion. Nonetheless, Eco falls for not only the perceived fidelity of representation but for the complete presence of that image

[98] Umberto Eco, *Travels in Hyper Reality: Essays* (Houghton Mifflin Harcourt, 1990), 4, 21.
[99] Ibid., 4.
[100] Pizzanelli, 431.

within his own environment — for its movement away from traditional image surfaces and into the space of the spectator — and Pizzanelli mildly chastises him for it. At the same time, though, Pizzanelli implies that this same mythological trick inherent in optical holography somehow sets up the very *imaginary* image he chronicles in his early history of scifi. The implication of the hologram's realism becomes the connotation of the "hologram's" humanity, especially as the scifi imaginary works to depict a fuller realism of its imagery — fixing true color, achieving full animation, and allowing the "hologram" not only to speak but to be granted consciousness and freedom — all the while never completely erasing its spectrality.

The additional effects won by the "mythical hologram" are the eventual erasure of representation and the temporal fixation of its imagery. While Barthes differentiates photos from drawings by suggesting that photos conjoin the present (image) with the past (object or scene that was imaged), the "hologram" emphasizes and foregrounds the present and plays down the past. The photo's link to the past is why Barthes viewed its imagery as "a contact with death"[101]; the "hologram," however, as discussed in my Introduction, strives to offer a contact with some degree of *life* — an interaction with something that at least is more alive than a traditional image if not quite as alive as its spectators, and either way is present with the viewing subject *now*. Seen through the lens of Flusser's communicology, the traditional image (like a drawing or painting) represents something existing elsewhere in the world, something that was seen and is now communicated forward in time via its image (even if the original something no longer exists); the technical image, however, veils the past of its antecedent just as it veils its projecting apparatus, in order to focus the viewing subject's attention only on the presence of this alleged *more-than-image* existing within spectator space. This is central to my coinage of the term

[101] Roland Barthes, *The Grain of the Voice: Interviews 1962-1980*, trans. Linda Coverdale (Evanston, Ill.: Northwestern Univ. Press, 1984), 356.

holo*presence*, intimating the currency of its experience and the hologram's or "hologram's" affective work in denying or at least demoting any other location of the figure's being other than its embodiment in *this* form with the spectator *now*.

Thus, the mythical "hologram" tries to naturalize its place not only in real space but among relationships with its human spectators, masquerading as unmediated presence. Alex Link, in an analysis of William Gibson's scifi novels, defines Gibson's descriptions of a similar, virtual-into-real "holograms" in strict terms of Barthes' mythological function as the "replacement of signified with signifier," adding that despite these "simulacral phenomena" initially appearing to spectators as "occult" and "uncanny," they ultimately "return the power to shape reality to the signifier."[102] The "myth of holography," then, ultimately extends something of Barthes' myth of photographic truth into the real (not virtual) third dimension — with the same misplaced assumptions about objectivity and a lack of mediation intact — functioning in a similarly mythological way, naturalizing the image as non-image, the object as subject. The fact that what is being naturalized as human is not actually human but a visual abstraction projected by a computer makes this transformation all the more extraordinary (and, perhaps, expands the scope of what is human).

The situation of abstract, digital "holograms" not just as representative images but as manifestations that enter into unique material and social relationships with their viewers further crystallizes Flusser's theory of the technical image. If the "hologram" can be a fresh creation rather than a photonic copy of an existing object, then this is what Flusser means by describing technical images as "immaterial"[103] or even holograms as "dimensionless"[104] — intentionally

[102] Alex Link, "Global War, Global Capital, and the Work of Art in William Gibson's 'Pattern Recognition'," *Contemporary Literature* 59, no. 2 (2008): 215, 226. The comparison is mine: Link does not cite Barthes.
[103] Vilém Flusser, *Into Immaterial Culture* (Metaflux, 2015).

provocative eversions of the words' denotative meanings, implying instead that even though a technical image like a hologram may be spectral and spatial, it is not required to *complete* its materiality in order to participate in material relationships. The "hologram" nakedly identifies itself as idolatrous, purposely enhancing an inherent slippage Flusser locates within the function of all imagery (traditional or technical) that causes them "to substitute that which is to be mediated."[105] But because technical images excel at projecting abstractions into material relationships, their very being is slippery (Flusser routinely calls it magic) in this way. Spectators of technical imagery, he says, "instead of using images in order to orient themselves in the world, start to act in the world in function of images."[106] That is, rather than seeing the "hologram" as a representational image — as a non-thing indexing a real but absent thing, or as the stand-in for the real actor to be encountered later — the holosubject acts on the field of holopresence without referents, in which an image that claims to be more than an image interacts with a subject who sees the "hologram" precisely that way, who will position themselves accordingly in the interaction, and who will not view the hyper-real experience as prohibitively uncanny.

In the years since the premiere of *Star Wars*, the film's original depiction of a new kind of "hologram" has been held up as an ideal within research and development of real-world digitally projected imagery. Princess Leia's iconic message exists as a meme, reproduced in headlines reporting on research — "In Search of the Princess Leia Effect," "MIT: Princess Leia

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[104] Vilém Flusser, *Into the Universe of Technical Images*, ed. N. Katherine Hayles, Mark Poster, and Samuel Weber, trans. Nancy Ann Roth, Electronic Mediations (Minneapolis & London: Univ. of Minnesota Press, 2011), 6.
[105] Flusser, *Into Immaterial Culture*, 12.
[106] Ibid.

Hologram 'Within a Year,'" "Princess Leia hologram could become reality"[107] — as well as within the scholarship itself,[108] including conference-catnip titles such as "How Feasible Are 'Star Wars' Mid-Air Displays?"[109] One of the companies working to solve the riddle of volumetric display is even called Leia, Inc.[110] Pizzanelli concludes his earlier chronicle with similar examples of the "myth made real," which signify to him the "spillover from the mythical hologram of fiction to the real world."[111] My next chapter looks at precisely such a spillover — an additional example of the "hologram" concept actualized within a specific real-world situation — as we return to real life (or at least real space) to encounter another emergence of holopresence, one whose creation and reception was fueled in large part by the myth of the scifi "hologram."

[107] Juan-Pablo Conti, "In Search of the Princess Leia Effect," *Engineering & Technology*, Sept. 20-Oct. 3 2008; Pete Pachal, "Mit: Princess Leia Hologram 'within a Year'," *Mashable* (2012), http://mashable.com/2012/10/08/mit-joi-ito-holograms/; Ian Sample, "Princess Leia Hologram Could Become Reality," *The Guardian*, March 20 2013.
[108] Larouche and Smith, ; Benton, ; N. Peyghambarian et al., "Rewritable Holographic 3d Displays," *Optics and Photonics* 19, no. 7 (2008); Alan Sullivan, "3-Deep: New Displays Render Images You Can Almost Reach out and Touch," *Spectrum, IEEE* 42, no. 4 (2005).
[109] Ismo Rakkolainen, "How Feasible Are 'Star Wars' Mid-Air Displays?" (paper presented at the 11th International Conference Information Visualization, Zurich, Switzerland, July 2007).
[110] Mike Orcutt, "New Display Technology Lets Lcds Produce Princess Leia-Style Holograms," *MIT Technology Review*, Feb. 25 2015. The Leia "hologram" myth even circled back around as a punchline in the eighth chapter of the *Star Wars* movies, 2017's *The Last Jedi*, in which a revived R2-D2 engages an aged Skywalker in a conversation, attempting to convince Skywalker to leave his exile. As Skywalker insists, "I'm not coming back," the droid activates its projection lens, showing a snippet of the original Leia message, which started the whole saga, to which Skywalker smirks, "That was a cheap move."
[111] Pizzanelli, 431, 436.

Chapter 4:
Keeping it real: The Tupac 'hologram' as a black life re-mattered

My only fear of death is coming back reincarnated.
— *Text of a tattoo on Tupac Shakur's right arm*

Figure 4.1. The "hologram" of the late Tupac Shakur (right) is seen performing on stage with rapper Snoop Dogg (left) on April 15, 2012 at the Coachella music festival in Indio, Calif. (Christopher Polk/Getty Images)

Late Sunday night, April 15, 2012 — the third night of the Coachella Valley Music and Arts Annual Festival in Indio, Calif. — hip-hop icon Tupac Shakur (2Pac) arrived on the concert's main, outdoor stage alongside fellow rappers Dr. Dre and Snoop Dogg. The surprise appearance occurred amid several unnamed "special guests" advertised to be joining the

Coachella concert's final headlining slot; these turned out to be four top rappers at the time (Wiz Khalifa, Kendrick Lamar, 50 Cent, Eminem). Tupac appeared deep into the 90-minute set that began at 10:35 p.m.,[1] the penultimate guest joining Dre & Snoop (**Figure 4.1**). Tupac made his entrance by seeming to rise slowly onto the stage as if from a trap door in the floor.[2] He stood erect, bald head bowed, mic in hand, shirtless, and wearing his usual jewelry. As the music began to build, Tupac acknowledged both of his counterparts on the stage, one after the other, with Dre specifically responding to him by an abbreviated nickname ("What's up, 'Pac?"). Tupac then stepped forward and addressed the audience, shouting, "What the fuck is up Coachella?!" The crowd of nearly 100,000 people[3] roared as he proceeded to stalk the center of the Coachella stage, performing two songs accompanied by a recorded backing track.[4] By and large, this was an everyday performance — only truly notable to those spectators who were aware (or were made aware) that Shakur had been shot and killed in 1996.

News and video of the surprise "hologram" performance became an internet sensation immediately following its first presentation.[5] The official video of the performance, uploaded to Snoop Dogg's YouTube channel, has been viewed more than 56 million times.[6] Within 24 hours, the digitally animated figure of Shakur had been given its own parody Twitter account

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[1] THR Staff, "Coachella 2012: Snoop Dogg Resurrects Tupac Shakur Via Hologram," *The Hollywood Reporter*, April 16 2012.

[2] This effect resembles the Corsican trap, a 19th-century stage effect for the entrance of ghost characters; see Chapter 1, footnote 54.

[3] G. Kaufman, "Exclusive: Tupac Coachella Hologram Source Explains How Rapper Resurrected," *MTV News* (2012), http://www.mtv.com/news/articles/1683173/tupac-hologram-coachella.jhtml.

[4] The Tupac "hologram" began with "Hail Mary," a track unfinished at the time of his death in September 1996 but completed by his associates and released in February 1997, and "2 of Amerikaz Most Wanted," a duet with Snoop Dogg released in May 1996.

[5] The Coachella festival presents its programming over two weekends, and the Shakur "hologram" was presented a second time one week later, on April 22, 2012.

[6] SnoopDoggTV, "Tupac Hologram Snoop Dogg and Dr. Dre Perform Coachella Live 2012," (YouTube, 2012), https://www.youtube.com/watch?v=TGbrFmPBV0Y, as of July 1, 2021.

(@HologramTupac) with more than 3,300 followers, growing to 20,000 within a week.[7] The week following the first performance, Shakur's 1998 *Greatest Hits* album returned to the Billboard 200 albums chart for the first time since 2000, making a sales gain of 571 percent over the previous week.[8]

The new, animated Tupac (2.0Pac?) was created and designed by digital visual effects specialists and implemented at the festival by collaborating production companies.[9] Using a combination of original animations and digital motion-capture techniques, the Tupac "hologram" was an original, digital video projection reflected onto a veiled, transparent screen situated so as to manifest the image in proportion to other living bodies on the stage. Where John Henry Pepper used lanterns and mirrors to reflect his spectral images onto sheets of onstage glass at the Royal Polytechnic Institution in 19th-century London (see Chapter 1), this 21st-century revival of his technical-image apparatus merely substitutes contemporary materials, such as bright, high-resolution digital projectors and transparent-reflective Mylar (**Figure 4.2**). From the point of view of the crowd, the projected 2D image appeared to be a 3D person standing between Dre and Snoop — one with sufficient visual and auditory cues to suggest that this may indeed have been Tupac Shakur.

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[7] Thomas H. Conner, "Rei Toei Lives!: Hatsune Miku and the Design of the Virtual Pop Star" (University of Illinois-Chicago, 2013).

[8] Keith Caulfield, "Tupac's Virtual Coachella Appearance Spurs Huge Sales Bump," *Billboard*, April 26 2012.

[9] The visual spectacle was created and designed by Digital Domain Media Group Inc. (an Oscar-winning visual effects studio that crafted digital effects for films such as *The Curious Case of Benjamin Button*, *TRON: Legacy*, and *The Girl with the Dragon Tattoo*) and then implemented by AV Concepts (San Diego, Calif.) using a system designed by Musion Systems (London). Musion's system, called Eyeliner, projected the Digital Domain creation from above onto a transparent screen on the stage (as shown in fig. 2). The original idea for the spectacle came from fellow rapper Dr. Dre, who received permission to pursue the project from Tupac's mother, Afeni Shakur, who was reportedly "positively thrilled" by the performance ("Tupac's Mom: Coachella Hologram Was Frickin' Amazing ", *TMZ*, April 16 2012).

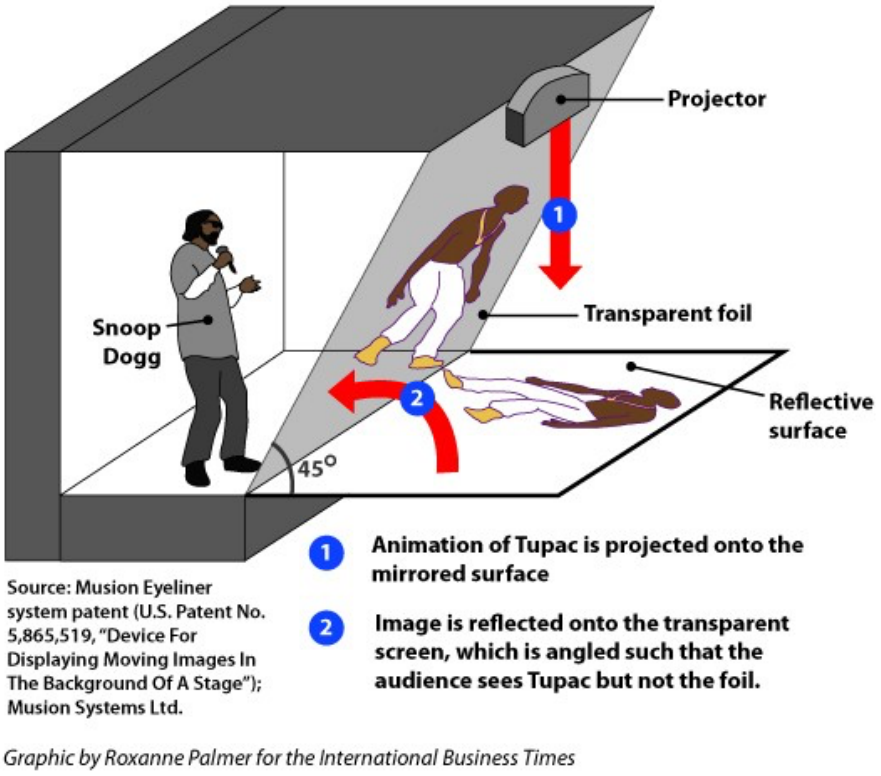

Figure 4.2. This diagram[10] shows the technical apparatus that produced the Tupac Shakur "hologram" on the Coachella festival stage in 2012. Compare to the arrangements of the original Pepper's Ghost in the 19th century: instead of reflecting light from an actor below the stage, this model projects digital animation from above, but the optical principles are the same.

If this dissertation's previous emergences of holopresence have provided pedagogical benchmarks for what an encounter with a "hologram" might look and seem like if it came to pass, then a specifically situated performance like this in which a human body is replaced with a digital projection offers early real-world experiments in which to examine the translation of the mythological "hologram" into everyday encounters. How natural *does* it seem to watch a "hologram" in place of a human performer? What sensory, material, and cultural factors contribute to a successful normalization and/or an uncanny failure of such an experience? What

[10] Roxanne Palmer, "How Does the Coachella Tupac 'Hologram' Work?," *International Business Times*, April 17, 2012 2012.

aspects of a person's individual body does the "hologram" actually embody? What signifiers of social identity categories does it extend, create, or erase? Half a century ago, Erving Goffman used the metaphor of the theater to suggest how individuals perform an aggregate of their identities within social life.[11] In this new emergence of performing holopresence, how is the actual theatrical presentation of a "hologram" succeeding in presenting a self — or at least an identity of its antecedent that is recognizable to the holosubject — within an everyday encounter such as a concert? This photo-realist depiction of Tupac indexed him through clear individual and social identity markers, and the recognition of the situated spectators was swift. Indeed, the first thing "hologram" Tupac shouted into the depiction of his microphone was, "You know what the fuck this is!" — and he was correct. As this chapter shows, subjects viewing the Tupac "hologram" did recognize, with remarkable fidelity, both *what* and *who* he was.

In this final chapter of my study, I analyze spectator reactions to the Tupac "hologram" in order to surface how emergent holosubjects in the Coachella crowd and those watching the resulting online video identified and classified who and what they saw within this specific context and how they expressed their explanations and sense of the experience. As I show, fans and news reporters discussed the phenomenon in the immediate wake of the event with a complex mixture of perspectives. Chief among these were attempts to assign the "hologram" a specific place on either side of the life-death binary, in terms of witnessing a technologically enabled resurrection. But regardless of whether they took this Tupac to be actually present and *materially* real, spectators wrestled with just how socially and culturally "real" this figure was. Whether man or ghost, spectators scanned the multimedia spectacle for clues to the original

[11] Erving Goffman, *The Presentation of Self in Everyday Life* (New York: Doubleday, 1959). The spatial metaphors of Goffman's individual self are themselves materialized and reimagined in the production of a "hologram" persona, with the "front" being the image-body at the center of the encounter and the "backstage" becoming a host of invisible laborers and apparatuses supporting the production.

Tupac's specific performance style and social identities (his blackness, masculinity, and street cred). The phenomenon presented each viewing subject a detective challenge, prodding them to compare and contrast what they recalled from their differently mediated experience of Tupac during his life with what they were able to see and hear from the Coachella stage or in the video.

What surfaces here, then, is a socially ingrained media savvy, a legacy of Pepper's situated relocation of the spectral to the technical and a new iteration of the inherently "haunted media" of the modern era, as explicated in my Introduction. Spectators of the Tupac "hologram" did not conclude that the phenomenon was spectral because they knew or could deduce its mediation; rather, they concluded that he was mediated because he seemed spectral. The media-savvy viewing subjects for the Tupac "hologram" were acutely aware that technologies rather than supernatural magic were presenting what they saw and heard, even if they knew little of the details. These holosubjects, as we will see, interpreted the presence of the dead rapper first by marveling at the technical mediation but then accepting that the same mediating process — indeed, by *virtue* of it — manifests its figure liminally as both alive *and* dead. Concert became communion — just another mediatized encounter with the archived dead. In his philosophical consideration of the digital Tupac, Matthew Harris compares the overt life-death quandary of this public phenomenon to relics of saints revered by religious devotees because, "although aesthetically and ontologically limited, the 'relic' of Tupac's hologram had value and impact for many Tupac fans because they believed he was still present."[12] Saint or no, the narrative of

[12] Matthew Harris, "The Hologram of Tupac at Coachella and Saints: The Value of Relics for Devotees," *Celebrity Studies* 4, no. 2 (2013): 239. This speaks directly to important work by Hans Belting, whose studies of traditional imagery in pre-Renaissance churches — the ways that painted icons of saints (and the management of the space in which they were encountered) evoked a richer physical presence of the dead figure — align interestingly with presentations of this digital technical imagery. See Hans Belting, *Likeness and Presence: A History of the Image before the Era of Art*, trans. Edmund Jephcott (Chicago and London: Univ. of Chicago, 1994); Hans Belting, *An Anthropology of Images: Picture, Medium, Body*, trans. Thomas Dunlap (Princeton: Princeton Univ. Press, 2011).

Tupac surviving his death was revived and enriched by the sudden presence of his spectral, mediated self.

Nonetheless, Harris suggests that the Tupac "hologram" ultimately failed to operate as a physical relic because spectators viewed the image as the person himself, rather than as a mediating object.[13] I'm showing instead, however, that how spectators *viewed* this image — and the meanings they ascribed to it in the immediate phenomenological moment of the encounter — was a far more complex mashup of actual mediating relic and any perception of unmediated reality. Few, if any, spectators reached an ontological conclusion about the complete physical existence of the Tupac "hologram" *because* they remained astutely aware of its technical mediation throughout the event. Significations of mediation (to a still-emerging, modern holosubject by this point) imply a degree of presence at least once-removed from full physicality; however, given that the projected digital "hologram" removes certain other signs of mediation (such as hiding both the screen and the projecting apparatus), the "hologram's" technical imagery refreshes the inherent spectrality of modern media (as discussed in my Introduction), allowing the mediated figure of the person to be revived more than their actual body.

This affords spectators the opportunity to access existing knowledge about the mediated image of Tupac (which is how most people "know" him, via video, television, photographs, and recordings) in order to classify and make sense of the novel phenomenon. Commercial relics of Tupac already controlled the maintenance and projection of the rapper's posthumous public image, as seven of his 11 platinum-selling albums were released after his death.[14] Existing markets and online media platforms may maintain posthumous presence and even limited

[13] Harris, .

[14] Zack O'Malley Greenburg, "Tupac Shakur Earning Like He's Still Alive," *Forbes* (2011), https://www.forbes.com/sites/zackomalleygreenburg/2011/05/31/tupac-shakur-earning-like-hes-still-alive/#1dbd5967641e.

agency,[15] and an additionally embodied technical image of Tupac merely reclaims one context that previously had been off-limits to the dead performer: the live stage. Thus, the Tupac "hologram" operated neither as a ghost, a man, nor as a purely technical object but as a new personification of a previously existing, historically situated, and mediated liminal entity: the performer persona, which I examine primarily through Philip Auslander's theoretical extension of that concept. "Holograms" allow for these particular spaces of performance to be further mediatized in ways that reopen them to a return of, if not the performers themselves, than at least new elements and echoes of their personae.

What that persona literally looks like — and, in particular, who controls the image — becomes a crucial factor in not only determining to what degree a "hologram" may seem more real but also how successful that image-body is in socially and culturally "keeping it real" on behalf of the wishes or the reputation of its deceased antecedent (or their fans, who participate in the construction of the persona). When an artist is removed from the production of their public image by virtue of being dead, their persona might continue to be reshaped and re-presented through a variety of media by business managers, public relations directors, media figures, and corporate stakeholders; when "holograms" are added to the media palette, the production collective then also adds visual artists and digital animators. These often invisible laborers determine how that image communicates not only the subject's overall ontology but its specific markers as a human individual — social signifiers such as gender, sexual orientation, ethnicity, and, especially in the case of Tupac, masculinity and race. While this study is not an analysis of discourses behind the scenes of that production, it does consider what emerges from it and how it is perceived — how the "hologram" packages and projects discourses about social identity.

[15] See Patrick Stokes, "Ghosts in the Machine: Do the Dead Live on in Facebook?," *Philosophy and Technology* 25, no. 3 (2012); James Meese et al., "Posthumous Personhood and the Affordances of Digital Media," *Mortality* 20, no. 4 (2015); Steve Jones, "404 Not Found: The Internet and the Afterlife," *Omega* 49, no. 1 (2016).

Those discourses, as shown below, explore every dimension of the "hologram" — the figure's presence and reality, the man's race and gender, the image's technical origin and cultural capital — and all with fulsome excitement and fascination.

No longer a scifi imaginary but a new extension of traditional cinema imagery (despite its illusion of extra dimension, digital "holograms" thus far are standard video animations), the projection of a "hologram" continues some of film's existing methods of creating, negotiating, and maintaining representations of social categories, especially race. bell hooks asserts that, this, "more than any other media experience, determines how blackness and black people are seen and how other groups will respond to us based on their relation to these constructed and consumed images."[16] Miles White notes that African-American culture in these representations is often "reduced to gold chains, expectations of violence and criminal activity, notions of deviance, and 'hood tales,"[17] and, as I show, these kinds of reductive representations were indeed at the forefront of media reporting and spectator reactions to the Tupac "hologram." Yet many hip-hop artists (and Tupac in particular) often skillfully used and enhanced these representations, as Herman Gray has argued, in order "to turn dominant representations of black male bodies into a contested cultural field" and to "imaginatively rework and rewrite the historic tropes of black heterosexual, masculine (hyper)sexuality, insensitivity, detachment, and cold-bloodedness into new tropes of fascination and fear."[18] Whether or not the "hologram" merely extends dominant representations of race or is able to participate in rewriting racial tropes — whether the "hologram" is *art* or an *artist* — is yet to be fully determined, but I end this chapter by pointing

[16] bell hooks, *Black Looks: Race and Representation* (Boston: South End Press, 1992), 5.
[17] Miles White, *From Jim Crow to Jay-Z : Race, Rap, and the Performance of Masculinity* (Champaign: Univ. of Illinois Press, 2011), 3.
[18] Herman Gray, "Black Masculinity and Visual Culture," *Callaloo: A Journal of African-American and African Arts and Letters* 18, no. 2 (1995): 403.

toward possibilities of the latter that thus far have not dominated critical readings of the Tupac "hologram" and others.

To demonstrate this case of welcoming digital imagery into spatial social life as well as its various degrees and strategies, in the following sections I analyze two sets of textual data focused on the initial performance of the Tupac "hologram" on April 16, 2012. I am conducting a discourse analysis[19] of (1) thousands of tweets posted to the Twitter social-media service in the 24 hours following the first Tupac "hologram" performance,[20] as well as (2) numerous news-media reporting and criticism in the same immediate 24-hour period.[21] I am examining these expressions to see if we can see what was seen by spectators of this particular technical image in context — how spectators seem to make sense of the unusual imagery, how they negotiate and express feelings of the uncanny, and to what degrees the Tupac "hologram" is resisted or allowed into the performance space typically occupied by a human subject. This analysis supports my

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[19] Discourse analysis here is founded in David Howarth's transportable "toolkit" of analyzing "talk and text in context" in alignment with a chosen social theory or set of them, particularly the focus on what he calls "reactive" subjects ("Applying Discourse Theory: The Method of Articulation," in *Discourse Theory in European Politics: Identity, Policy and Governance*, ed. Jacob Torfing and David Howarth (New York: Palgrave, 2005), 318, 336), as well as the original critical practices of Norman Fairclough (*Analysing Discourse: Textual Analysis for Social Research* (London: Routledge, 2003)), especially as modified for online and social-media contexts ("critical technocultural discourse analysis") by André Brock ("Critical Technocultural Discourse Analysis," *New Media & Society* 20, no. 3 (2018)).

[20] The tweets were collected from Twitter.com on Oct. 25, 2017 by searching the service for the terms "tupac" or "2pac" on the single date of Monday, April 16, 2012 — the day after the first Tupac "hologram" performance at the Coachella festival (since the performance started shortly before midnight the day before). This resulted in tens of thousands of individual messages, from which three random starting points were selected and the tweets coded from each point until results repeated and statistical significance was achieved, resulting in a data set of 8,172 individual tweets. All collected tweets were coded, by me, using a grounded-theory approach (Barney Glaser and Anselm L. Strauss, *The Discovery of Grounded Theory* (Chicago: Aldine, 1967)), generating 18 separate classifications: affect, ambivalence, appearance, confusion, explanations, exposure, futurism, others, realism, resurrection, second life/Shakur, second life/"hologram," scifi, supernatural, Tupac lives, uncanny/creepy, unknown, and YOLO.

[21] My discourse analysis also includes a few news sources from the same time period, online articles published after midnight on that Monday. This data features straight news accounts and fresh criticism of the event culled from two Google searches using the same parameters ("tupac" or "2pac"). The first search used Google News specifically, resulting in 19 complete news sources (after eliminating results that either mentioned Shakur in some other context or links that featured only a web-page embed of the video of the performance without any information or commentary). The second used Google's main search engine and returned more than 200 results, of which 33 news sources were selected (again, after eliminating embed-only pages, unrelated material, and any sources already collected by the previous Google News search).

overall claim that participation of the "hologram" in this performative social ritual serves to extend the performing persona of the deceased artist in certain ways without the continued participation of Tupac's body.

'Tooooooooooo real': Seeing the 'hologram' as myth made real

Mythologizing of the "hologram" image has succeeded at least in establishing a broad cultural footing for the scifi denotation of the term (as a digitally projected specter). Spectators of the Tupac performance immediately and consistently refer to the imagery as a "hologram." The word, in some form, appears in more than half of the April 16 tweets naming and describing the Shakur spectacle. A few tweets misspell the term (e.g., "hollogram," "holigraph," or my favorite possibly inadvertent wordplay: "hollagram"[22]), but while a dozen tweets during the day ask the Twittersphere some form of "What is going on?" no one in the data asks, in any form, "What is a hologram?" This itself demonstrates a tacit understanding of how a technical image with these characteristics had been culturally classified by that point. Minimal reporting in advance of the event leaked or announced the "hologram" appearance. These few instances, in which the spectacle was referred to by its creators as a "hologram," are shared very rarely by spectators within the tweet data, and most fans tweeting about the event are not referencing any sources other than their own immediate knowledge. They're calling it a "hologram" because, in 2012, they recognize one when they see it.

That widespread recognition occurs often through connections to scifi narratives, as seen in the large number of tweets comparing the Tupac imagery to "hologram" depictions from film

[22] On that note, misspellings, miscapitalization of words, and faulty punctuation are a frequent occurrence throughout everyday Twitter usage. To avoid racism or classism, I will *not* be noting each instance of it with an "[sic]" abbreviation.

and television, most often to *Star Wars* and the Princess Leia projection. Though I argue here that Tupac and subsequent performing "holograms" present themselves as individual entities closer to the liberated digital subject of *Star Trek*, the iconic image of the *Star Wars* projection of a 3D Princess Leia dominates industry claims about any and all accomplishments in "hologram" research and development, as mentioned at the end of the previous chapter. In fact, the same cultural image was widely available and drawn upon by spectators of the Coachella spectacle in order to identify, frame, and make sense of the phenomenon. One spectator even coined a verb using Leia's name to communicate the imaging process on display — "They princess leiad Tupac at Coachella"[23] — while another inquired hypothetically whether George Lucas had added the imagery to yet another update of one of the *Star Wars* films,[24] a comment that also communicates not only seeing the imagery but seeing a place for it within additional existing culture. A few fans took this upon themselves, creating and circulating one of the first notable online memes widely retweeted in relation to the 2.0Pac performance. **Figure 4.3** shows this image of the scene from *Star Wars* described in the previous chapter, into which the anonymous maker of the meme deftly Photoshopped the Tupac "hologram" in place of the princess. The creation and recirculation of this visual joke within hours of the availability of the image communicates a ready social knowledge base of a certain classification of technical imagery and contributed to the categorization of Tupac's technical image as the scifi mythical "hologram" finally realized in some form.

[23] ṀiND TRiCKš (@Bobby_light505). 2012. "They princess leiad Tupac at Coachella feast last night mother fuckers still killin' shit even after death. Respect. http://youtube.com/embed/8L73tGfOam." Twitter, April 16.
[24] KEVIN SCARED (@KevinBaird). 2012. "I'm late to this #Tupac hologram thing. Has Lucasfilm added him into the final scene of Return of the Jedi yet?" Twitter, April 16.

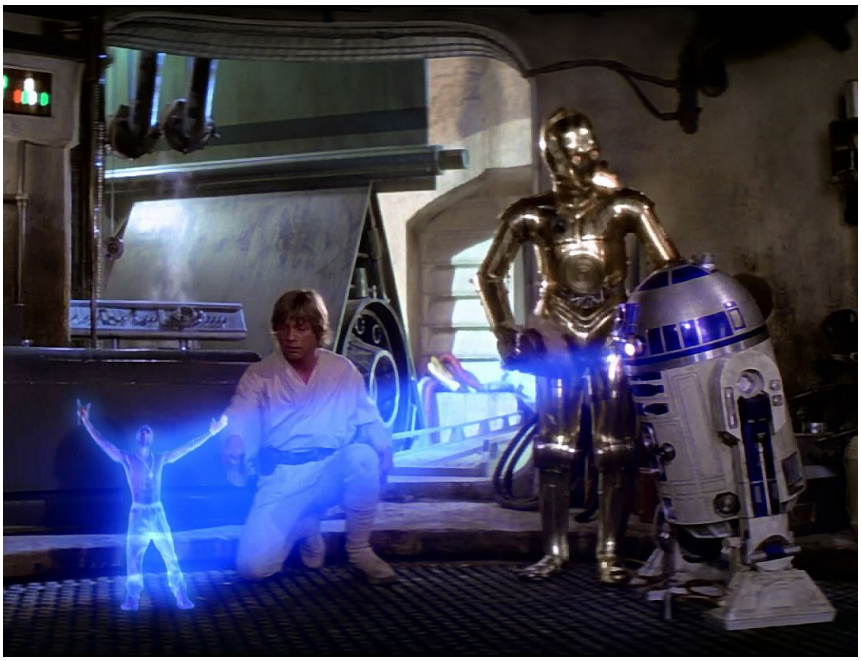

Figure 4.3. This image shows a visual meme that circulated widely in the hours and days following the Tupac "hologram" premiere. A screenshot of the first Princess Leia "hologram" scene in *Star Wars* has been altered so that the image of the princess is replaced by the Tupac image. (Compare to Figure 3.2, p. 156.) Repeated retweeting of this meme[25] helped categorize the Tupac image as the scifi mythical "hologram" realized.

But the subbing of the Tupac "hologram" in place of the white princess also may be read as a tidy reappropriation of white bodies in pop culture, a seizure of the liminality of the "hologram" in order to publicly perform a racial reconstitution. At the very least, such a repositioned image adds to a history of legitimate critiques of the *Star Wars* franchise for negatively portraying racial identities.[26] As a small instance of such possibility, the meme actually somewhat reverts the Tupac "hologram" back to a flat, screened image for digital circulation (even if it's still

[25] First appears in the data set from Amber Osborne [@MissDestructo]. 2012. "How many of you when they saw #holographictupac thought of this?" Twitter, April 16.

[26] The narrative's central human hero is blond and blue-eyed, while Leia's "hologram" itself depicts a white woman in angelic white robes, and most of the films' protagonists are white; in contrast, the films' numerous digitally visualized alien characters, such as Jar Jar Binks, Watto, and the Neimoidians, often project stereotypes of blacks, Jews, and Asians, respectively. See Christopher Deis, "May the Force (Not) Be with You: 'Race Critical' Readings and the 'Star Wars' Universe," in *Culture, Identities, and Technology in the 'Star Wars' Films*, ed. Carl Silvio and Tony M. Vinci, Critical Explorations in Science Fiction and Fantasy (Jefferson, N.C. & London: McFarland, 2007).

technical), but it nonetheless works as a method for subverting dominant histories and countering erasures of race.

Beyond *Star Wars* "hologram" references, the data set is peppered with a broad variety of quips relating to *Star Trek: The Next Generation*,[27] the British comedy *Red Dwarf*,[28] the animated series *Jem & the Holograms*,[29] the 2002 film *S1m0ne* (about the creation of a photo-realistic digital synthespian),[30] the early-1990s video game *Time Traveler*,[31] and many others, plus another nod all the way back to the communicative power of early 20th-century radio spectacles ("Thank God #HolographicTupac didn't read the old *War of the Worlds* radio broadcast. Everyone tripping at Coachella would've killed themselves"[32]). There are numerous nods to Japanese Vocaloid singers such as Hatsune Miku, as well. One news source mentions Miku by comparison as "a hologram without a real 'original'"[33] — a seeming attempt to communicate the lack of an antecedent body for that digital performer — and other tweets often cite Miku in a haughty tone, informing others that projection of a persona without a body in concert was not new, e.g., "You who marvel at 2Pac's half-hearted hologram, know that the Japanese hipsters have been doing it for a while"[34]). Again, these cultural connections

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[27] juux (@juux). 2012. "RT @VirtuaRapperNews Tupac's hologram to retire to the Enterprise D's holodeck with Rimmer and William Shakespeare." Twitter, April 16.
[28] SallyH16 (@SallyH16). 2012. "The Tupac hologram at Coachella was AMAZING. But where was the big silver H on his forehead, like Rimmer? #everyhologramshouldhaveone" Twitter, April 16.
[29] Little Loud Fauntleroy (@DirectingTitan). 2012. "My favorite part of Hologram 2pac was when he turned into Jem at the end." Twitter, April 16.
[30] Haydn Dunn (@HaydnDunn). 2012. "I seriously thought of this part of the movie S1M0NE after watching the 2pac hologram performance!! youtu.be/PkQAIHcpWfI." Twitter, April 16.
[31] Nick DiFabbio (@Ghostfreehood). 2012. "I have been waiting for this Tupac hologram bs ever since I played Time Traveler in the arcades back in the day. Its about damn time." Twitter, April 16.
[32] #1 RVAwonk (@writtenlow). 2012. "Thank God #HolographicTupac didn't read the old *War of the Worlds* radio broadcast. Everyone tripping at Coachella would've killed themselves." Twitter, April 16.
[33] "Musik: Rapper Tupac feiert sein Comeback als 3D-Hologramm," *Kronen Zeitung*, April 16, 2012, https://www.krone.at/318448, (translated from German with Google Translate).
[34] Roy (@roy_). 2012. "Uds que se maravillan con el holograma medio pedorro de 2Pac, sepan q los japos hipsters lo hacen desde hace rato ow.ly/ak41E," translated from Spanish with Google Translate: "You who marvel at 2Pac's half-hearted hologram, know that the Japanese hipsters have been doing it for a while." Twitter, April 16.

demonstrate that spectators are not just seeing the imagery and marveling at its immediate spectacle, but that they also are classifying it using a known typology of related imagery.

Science-fiction references in the data often conflate the technical delivery of such imagery with cultural superstition, delving past the denotation of "hologram" into its more uncanny, spectral connotations. As also highlighted in the previous chapter, depictions of "holograms" in the *Star Wars* franchise often overlapped with its imagery of ghosts. Just as several tweets refer to the Tupac "hologram" as something like "Jedi Ghost Tupac,"[35] others conflate the seemingly distinct contexts of technical display and supernatural haunting — joking, for instance, about "That awkward moment when Tupac's ghost performs at Coachella and everyone assumes it's a 'hologram.'"[36] News media rarely described the "hologram" in actual spectral terms, except in descriptive modifiers ("the ghostly reappearance," "the ghostly visage"[37]). Fans, though, often skipped technical references altogether and simply identified the image as a ghost (e.g., "I just saw a ghost"[38] or simply an exclamation as if vocalized: "GHOST!"[39]). I don't accept that these fans believed they were witnessing the manifestation and presence of a supernatural spirit; they were, however, drawing upon a similar cache of cultural knowledge at hand that might immediately explain and ascribe meaning to the spectral, embodied image of a dead person before them. The concept of a ghost is nearly universal in human cultures; the idea of a managed, mediated persona is not as well-known or widespread.

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[35] PeteHaas (@dimeford). 2012. "Apparently Jedi Ghost Tupac showed up at Coachella: http://tinyurl.com/7vtvq3r." Twitter, April 16.
[36] Kate Christensen (@katybearbug). 2012. "That awkward moment when Tupac's ghost performs at Coachella and everyone assumes it's a 'hologram.'" Twitter, April 16.
[37] Kaufman; "Opinion: The Problem with the Tupac Hologram," Billboard, April 16, 2012, https://www.billboard.com/articles/columns/the-juice/494288/opinion-the-problem-with- the-tupac-hologram.
[38] KU$H MARLEY (@IrishMarley). 2012. "I just saw a ghost. R.I.P. Tupac. Watch Tupac Hologram Live At Coachella (Full Performance) on YouTube." Twitter, April 16.
[39] MoNo (@No_Blunts_Bro). 2012. "@2PAC GHOST! youtu.be/__SnkRk3A_w." Twitter, April 16.

Thus, many spectators relied on the more readily available knowledge at their disposal to explain the sight of this particular technical specter.

The connection between those two contexts — the projection of a "hologram" and the manifestation of a spirit — mix together in interesting ways within this data, summoning the uncanny from the combination of technical allure and ghostly unease. Rarely are they completely separate. Fans usually express views about the manifestation of this deceased rapper as a supernatural event — but one that occurs essentially via natural means. That is, the "hologram" ghost doesn't just appear out of thin air as a magic event; rather, if the image is recognized as technical, then the technics themselves are recognized as the necessary method *for* the magic. Sometimes this is expressed in the data indirectly (e.g., "They bring the holographic ghost of Tupac Shakur to Coachella" and "They brought tupac back,"[40] with "they" operating as a highly loaded term with potentially racial and class implications, but in this context as one implying apparatus programming by insinuating its invisible programmers) or with the image recognized as technical but its projection ascribed to some manner of sorcery.[41] The common conflation of the resurrective function with technology — as in the headlines "Tupac resurrected via hologram" and "Tupac rises from the dead to perform as a hologram,"[42] as if the technical were an essential form for the resurrected — can seem on casual reading to be a figure of speech, but such figures of speech imply direct connectivity between the technical figuration and the spectral figure. Any mention of magic within the data is coupled with mention of the technology; the

[40] Reymon Hernandez (@ReymonJose). 2012. "Llevan el fantasma holográfico de Tupac Shakur a Coachella," translated from Spanish with Google Translate: "They bring the holographic ghost of Tupac Shakur to Coachella." Twitter, April 16.

[41] Colonel Tasty (@JoshhuaSays). 2012. "So, apparently, Tupac is a warlock or ghost or something." Twitter, April 16; keaundrey slocum (@slocum13). 2012. "That Tupac looked to real to jus be a hologram...that was witch craft he really was on stage." Twitter, April 16.

[42] Melrose Free Press (@MelroseFreePrss). 2012. "What to watch: Tupac resurrected via hologram at Coachella http://bit.ly/IQag89." Twitter, April 16; Wendy Zukerman (@wendyzuk). 2012. "Tupac rises from the dead to perform as a hologram. Brilliant." Twitter, April 16.

technology might be mentioned separately, but the magic never is. This furthers ideas about inherently supernatural associations with media and technology from a wide variety of social worlds and perspectives.[43] Tupac wasn't just back from the dead, he was "Back from the dead thks to technollogy."[44]

But while technology was recognized as a present factor in the production of the 2.0pac experience, spectators immediately after the spectacle rarely sought to peer behind its curtain or open its black box. This is roundly true of the fans on Twitter, who express little interest in the workings of the technology and share very few links to technoscientific explanations in news stories and websites; when they do, it is usually without additional comment. The first tweet offering up an explanation of the "hologram" projection appears nearly one-tenth chronologically into the data set, retweeting a technology columnist's brief explanation in *Time* magazine,[45] and such explanatory links were coded only seven more times out of the thousands of tweets. The first actual question asked of the production in a tweet — "how did they do that?"[46] — doesn't appear in the data until a third of the way through and is the *only* tweet coded with any form of that question. The news media, however, are dominated by explanatory material: at least some mention of the technical source of the spectacle, its creators, and the process of its realization appears in more than two-thirds of the news reports about the event. Spotlighting the spectacle's technological origins is often the headline attraction — the *Time*

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[43] See my Introduction for explications of spiritualist media theories from Jeffrey Sconce, *Haunted Media: Electronic Presence from Telegraphy to Television* (Durham & London: Duke Univ. Press, 2000); John Durham Peters, *Speaking into the Air: A History of the Idea of Communication* (Chicago: Univ. of Chicago, 1999), plus Eric Kluitenberg's "Connection Machines," in *Book of Imaginary Media; Excavating the Dream of the Ultimate Communication Medium*, ed. Eric Kluitenberg (Rotterdam: NAI, 2006).

[44] Mike Alfonseca (@mikealfonseca). 2012. "Back from the dead thks to technollogy. Tupac Hologram Full Performance Coachella 2012: youtu.be/ajVGIRsKXdo." Twitter, April 16.

[45] PARTY WITCH (@party_witch). 2012. "RT @TIME: Here's the technology behind the Tupac hologram | ti.me/HCXfdm (via @Techland)." Twitter, April 16.

[46] KingofCali510 (@Darealjnickel). 2012. "That tupac concert looked Fucking crazy how did they do that." Twitter, April 16.

column is titled "The Technology Behind the Tupac Hologram at Coachella," and other headlines mention "the help of 3-D technology" and declare that "Technology brings Tupac back to life at Coachella"[47] — while numerous reports draw from a previous AV Concepts press release, in which the project's genesis and execution are detailed, if the release is not reprinted entirely.[48] As a music critic in Chicago at the time, I myself first learned about the event via reports from my national colleagues; a month later I bookmarked a detailed explanatory piece titled "How Does The Coachella Tupac 'Hologram' Work?,"[49] which included the clear diagram of the updated Pepper's Ghost projection apparatus (**Figure 4.2**) that I have shared in research frequently ever since. Thus, information about and explanations of the technology presenting the illusion were readily available at the time of the event itself, yet few spectators sought them out as means of making sense of their immediate experience.

The visual aspect of the Tupac spectacle that most nudged its imagery into the Uncanny Valley (as explicated below) was its sophisticated attempt at visual realism. Throughout the data, spectators link the realism of the imagery to expressions of unease about the experience. This occurs not only directly — in overt statements saying that the image "looked a little real, kind of creepy though"[50] — but also in the coding of the data. The largest coded sets are for the categories "realism" and "uncanny/creepy." These categories are not exclusive to one another, however; the most frequently double-coded tweets were those single statements that fell into *both* categories. Spectators didn't so much report only that Tupac looked real *or* looked creepy;

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[47] Jacob E. Osterhaut. 2012. "Rapper Tupac Shakur hits stage at Coachella with the help of 3-D technology," *New York Daily News*, April 16, https://www.nydailynews.com/entertainment/music-arts/back-dead-rapper-tupac-returns-stage-coachella-3-d-technology-article-1.1062595; Wauters, Robin. 2012. "Amazing video: Technology brings Tupac back to life at Coachella," The Next Web, April 16, https://thenextweb.com/shareables/2012/04/16/amazing-video-technology-brings-tupac- back-to-life-at-coachella/.

[48] Edgar, Alvarez. "Tupac hologram performs at Coachella, keeps all eyez on him," Engadget, April 16, 2012, https://www.engadget.com/2012-04-16-tupac-hologram-performs-coachella-2012.html.

[49] Palmer.

[50] Ka-mar-i-uh (@ItsKamariaDoeee). 2012. "Anybody saw the hologram of Tupac at Coachella, looked a little real, kind of creepy though." Twitter, April 16.

they continually claimed he looked real *and* creepy — or, by a significant margin, that he looked creepy *because* he looked so real. The high degree of realism in the digital animation evoked the signature combination of allure and unease that defines the uncanny, as recorded by these spectators. This is present throughout the Twitter responses, often expressed in superlative terms: the “hologram” repeatedly “looked so real,” and it “gave me goosebumps on how real that looks!”; it appeared to be so real that “Honestly i couldn’t tell it was a hologram. #Amazed,” and left lasting impressions (“I still can’t get over how real this video looks”).[51] In more instances, it’s a matter of degrees, such as claims that Tupac exceeded a threshold of realism: “dat shit looked too real,” “a bit TOO reaal [with a shocked-face emoji],” “toooooooooo real.”[52] Fans quoted in news media continue the trend — “It was eerily realistic,” says one concertgoer; “so real it’s scary,” says another[53] — while the news writers themselves situate the realism of the imagery in terms of being too extreme: “ultra-realistic” or “all-too-realistic.”[54] By contrast, very few tweets outright critique the imagery as appearing fake, though some called it out as low-resolution (“looked like a 2K model”), while others still linked their critical judgment to an

[51] REAL NIGGA JULIE (@Julie_DaProblem). 2012. “Yess it looked so real RT @ImCanary: Sooo did everybody see 2Pac at Coachella.” Twitter, April 16; john daly (@passtherockyo). 2012. “Yo this tupac hologram shit is crazy af!!! Gave me goosebumps on how real that looks!” Twitter, April 16; Peter Marshall (@petestosaucy). 2012. “Coolest thing I've seen is gotta be the tupac hologram.. Honestly i couldn't tell it was a hologram. #Amazed.” Twitter, April 16; LeniseLigon (@LeniseLigon). 2012. “I still can't get over how real this video looks #Tupac Hologram.” Twitter, April 16.

[52] Ֆhåωƭ (@ShawtSantana). 2012. “Jus seen a video with a Halogram of 2Pac doin a concert......dat shit looked too real.” Twitter, April 16; Jada (@relentlessjada). 2012. “the holograam of Tupac looks a bit TOO reaal 😮.” Twitter, April 16; Sarah Lee (@HotChipss). 2012. “This tupac video is creepy. It looks toooooooooo real.” Twitter, April 16.

[53] Osterhaut; Kuperinsky, Amy. 2012. “Tupac springs back to life at Coachella,” NJ Advance Media, April 16, https://www.nj.com/entertainment/2012/04/tupac_hologram_coachella.html.

[54] 2012. “Fans Buzzing Over Tupac ‘Resurrection’ At Coachella,” CBS Los Angeles, April 16, https://losangeles.cbslocal.com/2012/04/16/fans-buzzing-over-tupac-resurrection-at- coachella; Makarechi, Kia. 2012. “Tupac At Coachella: Rapper Comes Alive Via Hologram To Join Dr. Dre & Snoop Dogg On Stage,” The Huffington Post, April 16, https://www.huffpost.com/entry/tupac-coachella-hologram-snoop-dre-video_n_1427925.

uncanny experience ("looks scary but you can tell its fake").[55] Either way, spectators comment on the imagery's realism as a means of identifying it as imagery, as not a human body, as "fake." The experience of its visual realism thus cannot avoid the range of negative affective response. In other words, one cannot produce a realistic image without creeping out the spectator, at least a little.

Thus, the trajectory of commentaries about any perceived realism of the Tupac imagery runs toward claims of uncanny creepiness. A steady rhythm throughout the Twitter data is one of realism/uncanny/repeat: Tupac "looks sooo real that its kinda frightening," "looks mad real! Like it's creepy," and it's "sooo realistic," but the tweet ends with "#creepy."[56] Most expressions in these categories deploy terms like "creepy," "weird," or refer to the raising of gooseflesh.[57] Many spectators go as far as exclaiming about outright fear generated by the viewing experience: the "hologram" is "terrifying," it gave spectators "chills" and "shivers," was either "kinda scary," "scared the shit out of me," or delivered a superlative fright ("Medo mil," Portuguese for "Fear times a thousand").[58] In addition, though the data only includes immediate reactions within the

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[55] RIP BirthOfTheWicked (@Scrimsurlalune). 2012. "Just saw the Tupac holo. That shit was terrible LOL. Nigga looked like a 2K model." Twitter, April 16. This tweet refers to video games by the 2K company; 10.11.15 (@Walters__). 2012. "The 2pac ting looks scary but you can tell its fake." Twitter, April 16.

[56] Susie Carmichael (@_SwagLikeSusie). 2012. "Just watched this Tupac hologram it looks sooo real that its kinda frightening." Twitter, April 16; ken (@_kendramonet). 2012. "I just watched that Tupac thing again.. It looks mad real! Like it's creepy O_O." Twitter, April 16; Mara (@alerriebadger). 2012. "Watched the video and Tupac's hologram was sooo realistic. #creepy." Twitter, April 16.

[57] One spectator tweeted in Spanish, "Acabo de ver el video de Tupac en Coachella y se me puso la piel 'chinita', no imagino lo verguísima que fue estar ahí" (Lalo @_lalopaloOza_ · 16 Apr 2012). Google Translate turns the word "chinita" into "Chinese" in English: "I just saw the video of Tupac in Coachella and my skin was 'Chinese', I can't imagine how awful it was to be there." Online sources suggest the term "chinita" is used as slang to mean "Asian girl" but to connote a pejorative about a person of mixed race, which could reflect something of the uncanny struggle with the particular liminality I'm claiming for this imagery. However, numerous Spanish-speaking colleagues assert that the term likely translates more accurately as "goosebumps."

[58] Jordan Cook (@jlcook89). 2012. "The tupac hologram is terrifying." Twitter, April 16; Just Tia (@TiaVsYoMama). 2012. "That Tupac Hologram though..... Gave me chills." Twitter, April 16; Bennyyyy (@Bennyfewl). 2012. "Not gonna lie watching that tupac hologram gave me shivers *tear." Twitter, April 16; Samairrah Monique (@Nerd_inDisguise). 2012. "That hologram of Tupac was kinda scary .." Twitter, April 16; Byrd (@kk_maree). 2012. "RT @FliCityRome: That 2Pac shit actually scared the shit out of me... Me too I got a weird feeling." Twitter, April 16; Bruna Candido (@bruuhisnotdead). 2012. "E esse show de holograma do Tupac

first 24 hours after the "hologram" performance, spectators already recognize that the uncanny aspect of this experience will linger: "that just might taunt me during shut eye tonight," "#chillsfordays," and "I won't sleep well I know" because, in at least one case, "The Tupac hologram has made me paranoid.. I can't sleep, I keep thinking his gunna appear in my room."[59] Nearly on par with comparisons of the Tupac image to a ghost are multiple references to "Zombie Tupac" and a few to his "zombie" sex organ.[60] The element of the uncanny here rises not so much as a haunting spirit but as unease about whether the body they saw was alive or dead, motivated or animated. The Tupac image, in its attempt to masquerade as a body and in an embodied context, teased a seemingly settled boundary between these states.

Such a tug-of-war between states of being and respective emotional responses to them occurs over the pit of Masahiro Mori's Uncanny Valley.[61] Originally theorized as a measure of affective response to robots but in recent years transferred to technical imagery, from CGI film characters to "holograms," Mori's theory posited (but did not prove[62]) that the more

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que teve no Coachella? hahahahha Medo mil," translated from Portuguese with Google Translate: "And this Tupac hologram show that you had at Coachella? hahahahha Fear a thousand." Twitter, April 16.

[59] K D P (@JusCallMeKris). 2012. "NOT watching 2pac hologram .. I LOVED him but that just might taunt me during shut eye tonight. Lol." Twitter, April 16; holl (@holliepandza). 2012. "Just watching the tupac performance on YouTube gets me.. #chillsfordays." Twitter, April 16; Mark Gable (@MarkTGable). 2012. "This hologram Tupac is fucking creepy, but funny... I won't sleep well I know." Twitter, April 16; 12 (@its_CJ12). 2012. "The Tupac hologram has made me paranoid.. I can't sleep, I keep thinking his gunna appear in my room.. *awkwad face* #ThatsTheTruth." Twitter, April 16.

[60] Esther-Lila Sanchez (@EstherLila). 2012. "I like to call hin Zombie Tupac. 🙂." Twitter, April 16; swizane (@swizane). 2012. "RT @BasedMoonie the fact that people are talking about hologram tupac's zombie dick let's me know we are in the last days." Twitter, April 16.

[61] Masahiro Mori, "The Uncanny Valley," *Energy* 7, no. 4 (1970).

[62] Rather than a "hard" scientific theory, Mori's theory remains a useful visualization of an idea about affect within a specific phenomenological encounter. Mori himself later framed his original essay as just that: a rumination rather than an argument, a way to begin framing his "intuition" about "just one of the things that I sensed" (Norri Kageki, "An Uncanny Mind: Masahiro Mori on the Uncanny Valley and Beyond," *IEEE Spectrum* (2012)). This has opened the Uncanny Valley to fair criticism for being "pseudoscientific," for instigating a "theological" debate that offers scant data (Dan Ferber, "The Man Who Mistook His Girlfriend for a Robot," *Popular Science* 236 (2003)). More recent studies have attempted to shore up a quantitative basis for Mori's suggested effects — namely in psychology and cognitive science (Francis McAndrew, T. and Sara S. Koehnke, "On the Nature of Creepiness," *New Ideas in Psychology* 43 (2016); Shawn A. Steckenfinger and Asif A. Ghazanfar, "Monkey Visual Behavior Falls into the Uncanny Valley," *Proceedings of the National Academy of Sciences* 106, no. 43 (2009); Kurt Gray and Daniel M. Wegner, "Feeling Robots and Human Zombies: Mind Perception and the Uncanny Valley," *Cognition* 125, no. 1

anthropomorphic a robot was made, the more likeable it would seem to humans, although a range exists along that trajectory in which human responses become intensely unlikeable and which when charted by a line graph appears as the distinct dip that became Mori's namesake "valley." This is when the robot is perceived as not-quite-robot but also not-quite-human and thus between states, alive *and* dead — in a word, creepy.[63] Nonetheless, as previously discussed, the uncanny is not purely unease; it is an inextricable blend of creepiness and fascination, and spectators of the Tupac "hologram" consistently balance their expressions of awfulness with awe. Tweets voicing creepiness routinely also mention fascination, allure, and attraction to the spectacle. Many fans can't seem to settle on either emotional experience, vacillating back and forth between statements: it's "Creepy.. But cool in a weird way.. But creepy," "pretty dope. A little surreal and creepy...but still dope," "weird. Amazing technology, but weird."[64] One

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(2012); Maya B. Mathur and David B. Reichling, "Navigating a Social World with Robot Partners: A Quantitative Cartography of the Uncanny Valley," ibid.146 (2016)), including the work of UCSD's Ayse Pinar Saygin (Ayse Pinar Saygin et al., "The Thing That Should Not Be: Predictive Coding and the Uncanny Valley in Perceiving Human and Humanoid Robot Actions," *Social Cognitive and Affective Neuroscience* 7, no. 4 (2012)) — and the theory has been taken up within fields far beyond robotics, from philosophy to design. Mori's theory may even lean toward the theological, but it has been indispensable in initiating and framing these explorations of technical encounters emerging in recent decades. As Karl Popper famously said of Darwinism — that it "is not a testable scientific theory, but a *metaphysical research program*" — I agree that Mori's own theory "is invaluable" to science (Karl Popper, *Unended Quest: An Intellectual Autobiography* (London & New York: Taylor & Francis, 1976/2005), 195, 199).

[63] The original Japanese title of Mori's essay, "Bukimi No Tani," translates as "Valley of Eeriness"; his concept was first referred to as the "uncanny valley" in a popular 1978 book on robotics: Jasia Reichardt, *Robots: Fact, Fiction, and Prediction* (London: Thames & Hudson, 1978). Reichardt also published an art critique in 2004 titled *Uncanny Valley: Recent Sculptures by Tim Lewis* (National Museums Liverpool), shortly before Mori's original paper received its first English translation in 2005. Karl MacDorman explains that this first translation was done hastily in a single hour with the help of a Japanese colleague, Takashi Minato, at Hiroshi Ishiguro's Android Science Laboratory at Osaka University. "Over the years, that sloppy translation became a kind of reference for those interested in the uncanny valley, so I felt obligated to fix it," he explained years later when, in 2012, a new translation was completed with Norri Kageki (Jeremy Hsu, "Robotics' Uncanny Valley Gets New Translation," *Live Science* (2012)) and posted online: Masahiro Mori, "The Uncanny Valley: The Original Essay by Masahiro Mori," *IEEE Spectrum* (1970/2012), https://spectrum.ieee.org/automaton/robotics/humanoids/the-uncanny-valley. The resulting wider exposure met a ready readership, as it coincided with an increase in the appearance of hyper-real technical images of human subjects and digital actors (or "synthespians") presenting the kind of manufactured human likeness Mori's theory initially speculates about.

[64] lowkeytho (@GarySalg). 2012. "Just saw the hologram 2pac 'performance'.. Creepy.. But cool in a weird way.. But creepy.." Twitter, April 16; Nique Love Rhodes (@NiqueLoveRhodes). 2012. "the holographic Tupac during Snoop & Dre's Coachella performance was pretty dope. A little surreal and creepy...but still dope." Twitter, April

spectator said the "hologram" performance "Kinda gave me chills," and yet "I keep watching it over and over."[65] News media, seeking to capitalize on Web 2.0 ways they might boost reader feedback on the spectacle and thus increase their website traffic, occasionally used this precise quandary to pose questions and readership polls, such as when WRC-TV, the NBC station in Washington, D.C., posted: "Tupac's hologram: disturbing or entertaining?"[66]

Like the original Pepper's Ghost, the image of Tupac is presented to appear as much like a solid human body as possible. For four-and-a-half minutes, the Tupac "hologram" stalks the Coachella stage, his feet on the ground, literally and figuratively. He does not glow like a Jedi ghost, and only detailed scrutiny of the video reveals the very few and slight instances of his body's visible spectrality.[67] His predominately bluish tint seems to result from the lighting gels that would be illuminating his actual body were it on stage with the others. He talks and walks, with a fairly wide range of motion. He is proportional to the two other performers next to him, and he holds a microphone as if he has a voice to be amplified in the same way theirs do. Nothing about the animation depicts anything counter to the sight of a human body or the expected ways for one to move and act in the world — until the final two seconds. At the end of the performance, Tupac stands before the crowd (see **Figure 4.4**), bows his head, and vanishes in a supernova effect of a bright light flash and an instant of sparks fading out within the outline of

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16; MΛLI THE FOURTH (@MalickIV). 2012. "Yeah I found that 2pac hologram thing weird. Amazing technology, but weird." Twitter, April 16.

[65] Nanii Rodriquez (@Nanii_o8). 2012. "I'm not going to lie....that #Tupac performance at #Coachella was amazing…. Kinda gave me chills....I keep watching it over and over." Twitter, April 16.

[66] NBCWashington (@nbcwashington). 2012. "Tupac's hologram: disturbing or entertaining?" Twitter, April 16.

[67] It's not easy to catch. Any Leia-like moments of clearly visible transparency seem to have been painstakingly avoided. Early in the performance, the Tupac "hologram" is seen standing in front of a drummer playing behind him, and the image successfully conceals the musician as would a real body. But with careful inspection, one can see transparencies at 1:15 (a reflection of equipment behind him shows through Tupac's right shoulder), 3:16 (a stage-light reflection on a wall behind him shows through Tupac's chest, very briefly), 3:31 (a line of light on the stage surface appears through Tupac's ankles repeatedly for several seconds), and 4:00 (overhead stage lights flicker through Tupac's left shoulder). The official video could have been shot and/or edited with the express concern of minimizing these visual artifacts, too.

his former body. This added special effect is its own "reveal," and for any spectators who may not have deduced the illusion by this point, the flash-vanish puts a period on that reality (though, notably, this visual effect is mentioned by only one news-media report[68]). Like Pepper's stage actor swinging the weapon through the skeleton-ghost on the Polytechnic stage, no question is left as to the mediated ontology of this Tupac.

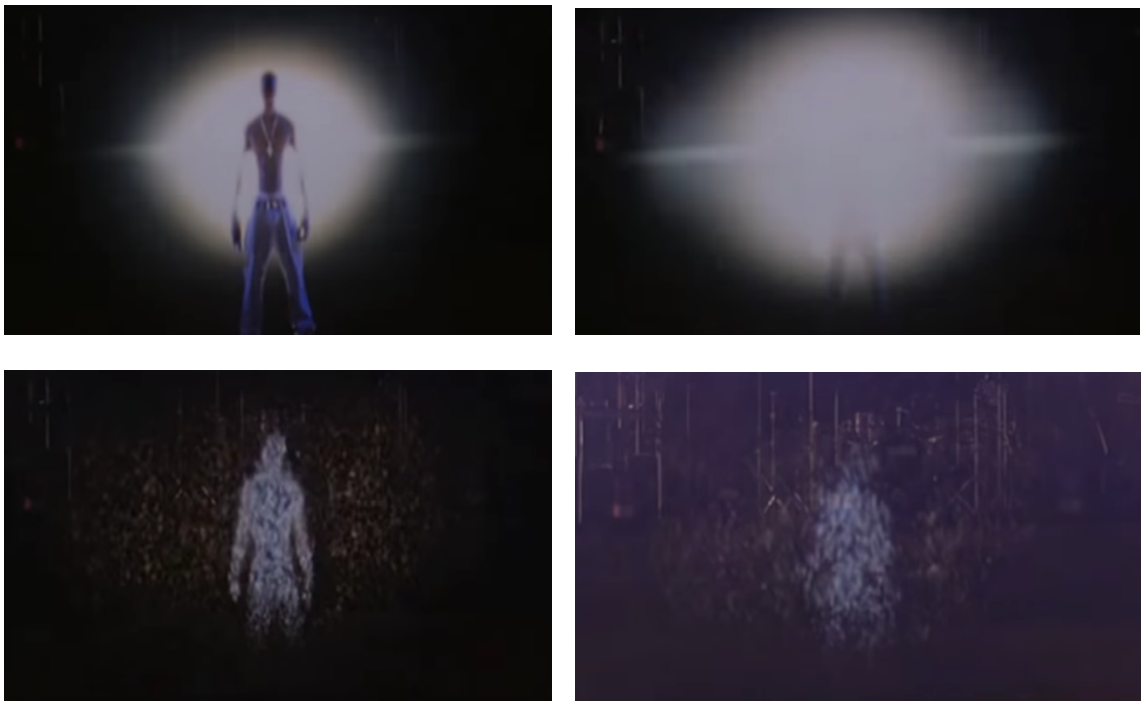

Figure 4.4. Selected frames of the YouTube video showing the Tupac "hologram" during its final two seconds on the Coachella stage. Once finished rapping, Tupac stood still and lowered his arms (top left, proceeding left to right) before his body was consumed by a bright flash of light, which winked out as the shape of Tupac's body dematerialized into lightly glowing sparkles, and finally lost humanoid form altogether.

Projecting the revived figure of any dead person back into a "live" performance space creates a complex phenomenon, but the specific choice of Tupac — an icon of black celebrity

[68] "At the end of the act, hologram Tupac exploded into an impressive light display." See Suddath, Claire. 2012. "How Tupac Became a Hologram (Is Elvis Next?)," *Bloomberg News*, April 16, https://www.bloomberg.com/news/articles/2012-04-16/how-tupac-became-a-hologram- is-elvis-next.

and black masculinity — for this particular mode of mediated performance further complicated this initial instance. For many spectators in 2012, perceptions of the Tupac "hologram" and expressions of its immediate meanings were filtered through nearly two decades of conspiracy theories surrounding the rapper's death. Shakur was riddled by a gunman on Sept. 7, 1996, and died of the wounds several days later in hospital. Many fans, however, refused to accept the physical evidence of his death and circulated longstanding claims that the rapper had faked or otherwise survived his own death and since had been living in secrecy — similar to but far more prevalent than posthumous rumors about other celebrities faking their death, such as Elvis Presley. "The value of Tupac being live is increased because he is meant to be dead," Matthew Harris writes, adding: "The hologram would almost certainly not have had the same power had it been of another male singer, such as Frank Sinatra, whose death was not disputed."[69] Tupac fans manufactured meanings of his "hologram" that justified both beliefs — that Tupac was dead, after all (because otherwise why wouldn't he appear "in the flesh"?), or that he indeed was alive (and this was either a telepresence projection of the real Tupac from some other location or an image whose realism only could have been achieved with the participation of Tupac himself) — that were expressed through a significant thread of the Tupac "hologram" discourse. Some spectators continue insisting that Shakur's death was a ruse designed to remove him from celebrity stresses and threats to his physical safety (or, as one fan speculated, "what reason would tupac need to fake his death? taxes"[70]). Regardless of the degree to which fans broadly and spectators of this event specifically may have sympathized with such ideas, they remained a

[69] Harris, 239. In fact, a Sinatra "hologram" had been produced three years earlier as a projected performance at TV music judge Simon Cowell's birthday party (http://www.musion3d.co.uk/portfolio/ frank-sinatra), and Celine Dion sang a duet with a "hologram" of Elvis Presley on Cowell's American Idol TV show in 2007. Aside from the novelty of the technology, neither of these projections of dead white men raised a lasting interest nor were socially discoursed as widely as the Tupac revival.

[70] Black Widow (@LoLoLoveAffair). 2012. "'@SuuprCoopr: what reason would tupac need to fake his death?' taxes." Twitter, April 16.

significant factor in the perception of a newly animate and seemingly embodied image of the *allegedly* deceased rapper. To these fans, this was less a resurrection than a reveal — a confirmation of the rumors' truth — and the choice of Shakur as a subject for this kind of display couldn't help but nurture these existing theories. The Tupac "hologram" served as a technical projection onto which many fans were able to psychologically project their own desires for his resurrection.

The "Tupac lives" code in this data set showcases the tug-of-war of this belief, divided fairly evenly between those who accept the faked-death rumors ("TUPAC LIIIIVES!") and those who don't ("Tupac Is DEAD!").[71] Many fans interpreted the "hologram" as representative proof of his continued existence in life — some generally, in terms of the image validating their beliefs in his existence.[72] Others denied the idea that what they saw was an image at all, declaring that the living Tupac was actually on stage ("That's not a holograph that's the reeal tupac !," "He never died. They just called it a hologram to trick us," and "16 years after faking his own death, Tupac Shakur finally returns to the stage by pretending to be a 'hologram' of himself – ingenious"[73]), while many fans scolded those with such beliefs ("Y'all crazy as shit if y'all think tupac is still alive ," "Yuh people believe ANYTHING!!!," and "ok stop it with the tupac is back

[71] Ally (@alMichelle_). 2012. "TUPAC LIIIIVES!" Twitter, April 16; ChrysSummers (@_reneetrilloaf). 2012. "Tupac Is DEAD!" Twitter, April 16. It's also notable that nearly 10 percent of all the tweets in this data set contain the word "alive" — not the word "live" in the context of discussing a live concert (that appears, too, occasionally) but "alive" in the context of identifying the image as not dead.

[72] G. Allstar (@skywokk). 2012. "Idgaf, Tupac is alive. I know this is a hologram but I just know he's out there lol." Twitter, April 16; Daniel Meehan (@DanielMeehan). 2012. "after this tupac 'hologram' shit, i know he's alive.." Twitter, April 16; marissa chavez (@LilMacMaster). 2012. "Is it weird that I could feel it in my heart while watching Tupac perform, that he's still alive .. ?" Twitter, April 16.

[73] Rocco Martini (@Cirocco_boy23). 2012. "That's not a holograph that's the reeal tupac ! #tupacBack." Twitter, April 16; IG: (@DocColonel). 2012. "Horseshit. He never died. They just called it a hologram to trick us. '@samdzimmerman: Guys, Tupac wasn't there.'" Twitter, April 16; Ramy Al-Rufaie (@DocRamy). 2012. "16 years after faking his own death, Tupac Shakur finally returns to the stage by pretending to be a 'hologram' of himself - ingenious." Twitter, April 16.

he is as dead as your brain is for thinking he alive"[74]). The realism of the "hologram," however, thoroughly complicated the otherwise neat boundary between the two camps. Many more argued specifically in terms of a technology that they immediately recognized, claiming that such a realistic image could not have been created without access to or participation by the living Tupac, whether that meant he was offstage providing the voice for the "hologram" or had helped create it previously as a labor-saving — or life-saving — device.[75] Either way, the paradox of presence was visible to many fans: "I told ya'll he wasnt really dead...hes just now coming back w/o really being here #genius" and "maybe tupac isn't dead. maybe he just has a problem with transparency."[76] As with Professor Pepper's explanations of the ghost illusion in my first chapter or the technical diagrams accompanying optical holograms at the museum in my second chapter, knowledge of the technical mediation affording spectators this particular experience did not necessarily disenchant that experience and helped construct a new mode of mediated spiritualism.

Many tweets express some level of awe through traditional Christian religious tones — "Tupac is back from the grave," "how could they let Tupac come back before Jesus," "The day after Tupac rose from the dead!! It's totally my Easter!!!"[77] — but many more combine

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[74] Rashad Tart (@Mr_Tart). 2012. "Y'all crazy as shit if y'all think tupac is still alive." Twitter, April 16; Kai (@Kailyn_Fenay). 2012. "i reallyy do NOT believe Tupac alive! Yuh people believe ANYTHING!!! #SMMFH." Twitter, April 16; Princess (@prettyladiep). 2012. "Ppl tupac is dead ok that's what's technology does ok stop it with the tupac is back he is as dead as your brain is for thinking he alive." Twitter, April 16.

[75] L E F T, PhD (@LeftSentThis). 2012. "That's a #HolographicTupac to some, but to conspiracy theorists, that's a REAL LIFE Tupac under the stage performing those vocals." Twitter, April 16; Christian McCurdy (@Chris_Connects). 2012. "I'm tellin y'all Tupac NEVER died! He just finally found a way to perform without being exposed lol #Tupacsback." Twitter, April 16; Kaylaaaaa.† (@KBZO_). 2012. "I wonder how Tupac felt while he watched his hologram self perform?" Twitter, April 16.

[76] Chris (@ChrisGoops). 2012. "People, calm down w/ all the Tupac hologram talk. I told ya'll he wasnt really dead...hes just now coming back w/o really being here #genius." Twitter, April 16; Arielle (@palefacearielle). 2012. "maybe tupac isn't dead. maybe he just has a problem with transparency." Twitter, April 16.

[77] Hannah Marie (@HMBourque). 2012. "So, Tupac is back from the grave becasue he appeared with Snoop Dog at Coachella?" Twitter, April 16; Miss Hip-Hop the A&R (@OHMissHipHop). 2012. "Lmfao! '@Sw1sherSweet HAHAHAH. RT @DeMarcose: how could they let Tupac come back before Jesus.'" Twitter, April 16;

performances of this awe with often humorous mentions of the technological context connected to the so-called resurrection. One fan, for instance, tweeted, “After 15 years, Tupac has come back to life. Imma ask him what heaven was like,” but ended the tweet with a telling burst of laughter: “lmao.”[78] In addition, during the early hours of Monday, the #YOLO hashtag and acronym (“you only live once”) trended again, based on clever uses of it to classify and critique the Tupac event. The gist was that the Tupac “resurrection” *disproved* the old adage — i.e., “YOLO..... Unless you’re Tupac!” with multiple variations on that idea (“well safe to say Tupac ruined YOLO”), including coinage of new acronyms like “YOLT - You Only Live Twice,” “YODO: You Only Die Once — unless you come back as a hologram” (featured as the label atop a posted photo of the “hologram”), and the new hashtag #HOLO, likely coined by the anonymous @HologramTupac account.[79]

Spectators granted the Tupac “hologram” an independent second life, even though its speculative details only echoed Tupac’s real past or jibes at other existing celebrities. We can see 2.0Pac taking on a life of his own. Even as the image is literally projected onto the stage, spectators begin taking on the figurative work of projecting that figure’s extended presence across time and space in different ways — doing at least the imaginative work available to them to liberate the Tupac “hologram” from its onstage *Star Trek* holodeck, as it were, and grant it an

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MGH (@MichelleGHunder). 2012. “The day after Tupac rose from the dead!! It's totally my Easter!!!” Twitter, April 16. It may be worth noting that the Tupac “hologram” performance occurred exactly one week after Easter. In addition, a narrative of Tupac returning from the dead is enhanced by its relationships to discourses of the black church in America through which resurrection of an oppressed savior resonates historically as well as theologically. See C. Eric Lincoln and Lawrence H. Mamiya, *The Black Church in the African American Experience* (Durham & London: Duke Univ. Press, 1990); Theo Witvliet, "In Search of a Black Christology: The Dialectic of Cross and Resurrection," *Crosscurrents/Modern Critiques* 37, no. 1 (1987).

[78] lona Sebhatu (@alloneezy). 2012. “After 15 years, Tupac has come back to life. Imma ask him what heaven was like lmao.” Twitter, April 16.

[79] Katie Portner (@ktportner). 2012. “YOLO..... Unless you're Tupac!” Twitter, April 16; CANDY CORN RULES (@ZachEClark). 2012. “@xoStephanieH: well safe to say Tupac ruined YOLO. #coachella.” Twitter, April 16; tgram$ (@TgramsThaGreat). 2012. “Cause YOLO, unless you're Tupac Shakur then YOLT - You Only Live Twice.” Twitter, April 17; Robbie (@RobbieWasntHere). 2012. “#tupacback Yolo Tupac.” Twitter, April 17; and @HologramTupac, which posted in the guise of the “hologram” from April 16 through April 23.

offstage life among humans. First, they envision additional sensory embodiments for him: dining out ("just spotted hologram 2pac at buff patty on myrtle copping a medium jerk goat platter"[80]), dating ("kim kardashian is now dating hologram tupac,"[81] implying that she left her real human husband for the "hologram"), and simply hanging out ("Ima invest in a Hologram projector, that way I can chill with 2pac"[82]). Beyond the visual sightings, some fans show a desire to enhance the embodiment of the persona by granting it the ability to be touched or smelled.[83] In granting "hologram" Tupac extensions of not only these visceral sensory experiences but a future in which they might occur, his holosubjects grant his imagery a greater degree of humanity.

Passing after passing away: 'Holograms' as human *enough*

The intricate level of detail about "hologram" Tupac's appearance as reported by both the news media and Twitter spectators signals an activation of a heightened degree of attention endemic to the uncanny experience — a hail to look harder at the technical image, and to detect. This media effect previously has been indexed by critics and scholars of digital film imagery. Film critic Roger Ebert interpreted the Uncanny Valley concept for the public by describing the all-CGI film *The Polar Express* as having characters that "don't look real, but they don't look unreal, either; they have a kind of simplified and underlined reality that makes them visually magnetic," even though he opened his review by noting that, along with that allure, "It's a little

[80] Dan Lewis (@danlewis212). 2012. "Yo @seanmattison: just spotted hologram 2pac at buff patty on myrtle copping a medium jerk goat platter." Twitter, April 16.
[81] neAAto (@neaato). 2012. "kim kardashian is now dating hologram tupac." Twitter, April 16.
[82] Dylan (@Shakur_Tupac). 2012. "RT @Itzwerm23: Ima invest in a Hologram projector, that way I can chill with 2pac and Trujillo 🙂." Twitter, April 16.
[83] NANA AWUAH (@thatkidnana). 2012. "Now that Tupac Hologram would have been more realistic if it was as hype as the original and if the others were able to touch." Twitter, April 16; neAAto (@neaato). 2012. "scratch and sniff tupac next." Twitter, April 16.

creepy."[84] He described another such movie, *Final Fantasy* as "a world that is neither live action nor animation, but some parallel cyberuniverse" in which "the filmmakers are not afraid to give us a good, long look — they dare us not to admire their craft.[85] Such an intensified gaze — and, as Ebert points out, one facilitated and encouraged by designers of this technical imagery — is what Vivian Sobchack, in her own analysis of digital screen characters, calls a "heightened and hyperbolic form of judgmental attention," a closer scrutiny than one would give traditional cinema or less-uncanny animation.[86] To trigger that heightened attention, however, a spectator must first experience the uncanny, must first pass through the shadow of death in the Uncanny Valley. The uncanny itself *stimulates* a desire to look closer, examine more fully, and attempt to analyze an experience or visual in depth. The uncanny nurtures a cultural and social state of detection and watchfulness as the spectator tries to ferret out the cause of the unease, the source of the fascination, the very living-or-dead state of the object or image. *If I can just look hard enough, long enough, and clearly enough, I'll produce a rational explanation of the imagery that will settle the uncanniness.* Likewise, this increased visual focus has been the downfall of other, post-Tupac attempts at performing "holograms." An initial attempt at digitally resurrecting Whitney Houston, for instance, was canceled before it appeared precisely because it failed to successfully reproduce markers of the late singer's identity.[87] Tupac's spectators thus are looking

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[84] Roger Ebert, "'The Polar Express'," *Chicago Sun-Times* (2004), http://rogerebert.suntimes.com/apps/pbcs.dll/article?AID=/20041109/REVIEWS/41006005/1023.

[85] Roger Ebert, "'Final Fantasy: The Spirits Within'," *Chicago Sun-Times* (2001), http://rogerebert.suntimes.com/apps/pbcs.dll/article?AID=/20010711/REVIEWS/107110301.

[86] Vivian Sobchack, "Final Fantasies: Computer Graphic Animation and the (Dis)Illusion of Life," in *Animated Worlds*, ed. S. Buchan (Bloomington, Ind.: Indiana Univ. Press, 2006), 179.

[87] Guardian music, "Whitney Houston's Hologram Appearance on the Voice Axed," *The Gurdian* (2016). This attempt at making a Houston "hologram" was pulled from its scheduled TV presentation when video of the performance leaked in advance. Fans decried the sanctity of using Houston's image in this way but also disparaged the actual look of the imagery, which was simply video footage a Houston lookalike (and not very alike, at all) rather than the comparatively meticulous digital re-creation of a likeness such as Tupac. A second attempt at a Houston hologram, by a different company, was scheduled to premiere in 2020 but thus far has been postponed due to the COVID-19 pandemic.

hard at the imagery — harder at the "hologram" than at other performers Sunday night at Coachella (news-media data does not include any mention of physical details about that night's human performers). They are trying to pin a label on the figure (alive/dead) and detect any identity passing.[88]

By labeling a function of the "hologram" as "passing," I mean to intersect with an existing literature about the discourses and practices of social identity passing.[89] Passing — and the game of trying to detect passing — is a social strategy in which a person makes themselves visible to others (or allows themselves to be) within a social identity category that is different from their own. Passing allows one "to assume (either actively or passively) membership within multiple communities"[90] and occurs among such categories as race, ethnicity, class, gender, sexual orientation, religion, age, and disability. Nella Larsen's 1929 novel *Passing* is a landmark exploration of the practice, featuring characters debating its merits, requirements, and consequences, but above all presenting it — from a historically situated African-American perspective — in noticeably ambivalent terms. Passing, for Larsen, is sometimes frowned upon, but not always or not to a rigid degree, depending on the situation. The character Irene observes generally, "It's funny about 'passing.' We disapprove of it and at the same time condone it. It

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[88] So am I, for that matter — this chapter is reflexive in that I myself am engaging in the same work, heightening my attention to the details of Tupac's new appearance in order to make similar claims as to if, how, and to what degree the image passes broadly as human and specifically as a black man. I have watched the official video of the event on YouTube numerous times, stopping and starting, freezing individual frames of the video to examine what might be seen in the imagery and seen through it. My examination is not unusual as a researcher; however, for the spectators of the performance itself to dial up their sensory attentiveness signals the activation of the uncanny within the social experience of this imagery. This chapter and all my previous attention to these matters is the result of my own activation when watching the video for the first several times in 2012 and having a similarly uncanny experience.

[89] Discourses of social identity passing date back to the 18th century and came to prominence in 19th- and early 20th-century American literature, explored chiefly as a racial phenomenon — see Mark Twain's *The Tragedy of Pudd'nhead Wilson* (1894), William Faulkner's *Light in August* (1932), and many stories (namely "The Passing of Grandison," 1899) by Charles Chesnutt, an African-American writer who was able to pass for white but often refused to do so.

[90] Jessa Lingel, "Adjusting the Borders: Bisexual Passing and Queer Theory," *Journal of Bisexuality* 9, no. 3/4 (2009): 382.

excites our contempt and yet we rather admire it. We shy away from it with an odd kind of revulsion, but we protect it.'"[91] She's describing the practice in pointedly uncanny terms — as that unique blend of revulsion and intrigue. Passing may be viewed pejoratively as supporting the very idea that racial categories exist to be passed *between* but also positively as implying that those categories are not rigid and offering a strategy for permeating them.[92] But as performance, passing implies both performer and audience. It implies that, if a particular performance of identity seems inauthentic, the spectator will then try to determine why that is, what factors contribute to that judgment. This practice of labeling individuals accordingly requires extra focus and skill, and *Passing* is threaded throughout with discourses of detection — how white people can detect light-skinned blacks, but also how other black people might know if someone is passing in certain contexts. Larsen regularly discusses the "ways … not definite or tangible" of accurately discerning between the "sheep and the goats."[93]

The "hologram" opens the practice of passing to new categories — as human, as alive — and the Uncanny Valley contributes an affective measure of where the image-body succeeds in the effort. The determination of humanity within an image, however, depends on the detection of sheep- and goat-level distinctions — social identity categories, such as race and gender. To pass as human is a meta-category; the Tupac "hologram" sought to pass as black, male, straight, butch, young, streetwise, etc. German scholar Claude Draude has studied situations in which

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[91] Nella Larsen, *Passing*, A Norton Critical Edition (New York & London: W.W. Norton, 2007), 39.

[92] Still, passing is often viewed as destructive to the passer in terms of diluting or degrading their membership in or ability to connect to their original identity category. Passing "nevertheless usually disables, and sometimes destroys, the self it means to safeguard" (Kimberlyn Leary, "Passing, Posing, 'Keeping It Real'," *Constellations* 6, no. 1 (1999): 85). See Frantz Fanon, *Black Skin, White Masks*, trans. Richard Philcox (New York: Grove, 1952/2008) for his psychological exploration of passing in terms of its nurturing of categorical dependency and feelings of social inadequacy. It is difficult to begin analyzing embodied technical imagery in these terms as of yet, but continued and future examinations of these human-hologram social interactions may begin to reveal such issues.

[93] Larsen, 55.

digital imagery succeeds or fails in "passing as human" based on certain identity categories.[94] Her critiques of anthropomorphic digital avatars and agents locate specific Uncanny Valley effects within the experience of digital imagery of human bodies across films, video games, and online social media. She focuses on whether and how performative signs of specific social identity categories (namely gender, but also race, age, and class) translate within mediated interactions between humans and technical images of humans. The more anthropomorphically precise each identity category is presented, the greater the whole image will be accepted and end up "passing as human."[95] Importantly, though, this does not mean spectators necessarily will *believe* the image to instead be a human being — the processes studied by Draude and myself are not ontological switcheroos — but that the image will perform *closely enough* to human expectations that it will *pass* in that realm. "This oscillating, in-between status is a reminder of ghosts," Draude says, "in the sense that there emerges a dematerialized body that lives in both worlds — the world of the living (humans) and the world of the dead (machines)."[96] The person who has passed *away* may return — *almost* — through the projection of a technical image that might at least pass as human in the spaces of humanity. That act of passing automatically situates the image liminally, unlocking the uncanny experience for the spectator, who may recognize that the image seems more than imagery but less than human, but *in so doing* brings the image closer to classification as human than *traditional* imagery previously has been afforded. The attempt to achieve realistic anthropomorphism, Draude says, "is used to reach a broader bandwidth in the

[94] See Claude Draude, "'It Is the between That Is Tainted with Strangeness': Das Unheimliche Geschlecht Virtueller Wesen [the Eerie Gender of Virtual Beings]," in *Das Unbewusste. Krisis Und Kapital Der Wissenschaften: Studien Zum Verhältnis Von Wissen Und Geschlecht*, ed. Christina von Braun, Dorothea Dornhof, and Eva Johach (Bielefeld, Germany & London: Transcript, 2009); Claude Draude, "Intermediaries: Reflections on Virtual Humans, Gender, and the Uncanny Valley," *Ai & Society* 26, no. 4 (2011); Claude Draude, *Computing Bodies: Gender Codes and Anthropomorphic Design at the Human-Computer Interface* (Wiesbaden: Springer, 2017).
[95] Draude, *Computing Bodies: Gender Codes and Anthropomorphic Design at the Human-Computer Interface*, 183.
[96] Ibid., 188.

interaction" between digital imagery and human spectators, allowing the simulation to serve "as a medium that is able to produce a direct and more intuitive form of information exchange"[97] — more direct and intuitive because, rather than drawing upon previous knowledge about and encounters with traditional imagery, the higher degree of anthropomorphic realism causes the spectator to instead draw upon previous knowledge about technical images already encountered.

The Tupac "hologram" did not seek to convince spectators fully of any real fleshy humanity; rather, he simply sought approval from an audience to pass within the context of musical performance and to share that space with humans. Granting this allowance was easier for spectators because little else about the concert differed from previous norms (the usual facilitators for producing meaning from the experience remained in play), and the realism of Tupac's image — the details of his liminally physical body — was enough to justify his presence there, especially as spectators strived to look closely. The Twitter data supports such effort ("i tried my best to see if i could see threw it"[98]) and shows the reporting of unusually intricate physical detail about the image, commenting on his abs, his youthfulness, his attractiveness ("tupac fine af even as a hologram"[99]), sometimes to an extraordinary resolution ("This Tupac hologram has arm hair!"[100]). In real life, Tupac was a significantly masculine figure, encapsulating the bravado, sexism, and violence of the gangsta rap genre.[101] His "hologram" prolonged enough trademark masculinity to elicit responses of support based on several aspects

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[97] Draude, "Intermediaries: Reflections on Virtual Humans, Gender, and the Uncanny Valley," 321.

[98] Sha'Quan (@uh_imDOPEbro). 2012. "was on worldstar and seen that Tupac hologram..i tried my best to see if i could see threw it." Twitter, April 16.

[99] Diego Teran (@diegoteran_). 2012. "Hahahahaha RT @diplo: i wish i had Abs like hologram tupac." Twitter, April 16; Daniel Dubois (@danielmdubois). 2012. "Tupac hasn't aged one bit in 16 years." Twitter, April 16; BaétHOven (@iAmAPickyEater). 2012. "RT @doobsNboobs_: tupac fine af even as a hologram || Girl. I said this same thing. Jesus H. Christ that man was sexy!" Twitter, April 16.

[100] Natalie McClinton (@good2bechosen). 2012. "This Tupac hologram has arm hair! They didn't miss a detail..coolest weirdest thing I've seen in a minute." Twitter, April 16.

[101] Derek Iwamoto, "Tupac Shakur: Understanding the Identity Formation of Hyper-Masculinity of a Popular Hip-Hop Artist," *The Black Scholar* 33, no. 2 (2015).

of it. The Twitter data includes numerous tweets expressing desire for Tupac in general ("Tupac is a sexy ass mthafcka"[102]) that likely have nothing to do with the "hologram"; these are simply fans coincidentally praising Tupac on Twitter at the same time.[103] Several fans, though, do link carnal desire to the digital body, from perspectives of both attraction ("I'd let Tupac's hologram bang me"[104]) and derogation ("I wonder how many ratchet groupies lined up backstage to get some of that hologram 2pac dick?"[105]). Dozens of tweets comment on the shirtless image's abdominal muscles — not only as signs of the figure's physical realism but as signifiers of his butch iconography, from admiration ("For Being Dead For 16 Years, Tupac's Body Is STILL Bangin'!"[106]) to awe ("I'm not even going to pretend that I was less blown away by the Tupac hologram technology than I was by his abs"[107]) to aspiration ("i wish i had Abs like hologram tupac"[108]). Spectators are working to match details to those recalled from Tupac's actual body.

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[102] Bubblez Cold (@BubblezCold). 2012. "Tupac is a sexy ass mthafcka... Omg." Twitter, April 16.

[103] Not directly related to the "hologram" but relevant to considerations of Tupac's masculinity as projected through technical imagery: It so happens that early in the Twitter data set, a movie starring Tupac Shakur, *Poetic Justice*, simultaneously aired on the BET cable channel between 1 and 3:30 a.m. Monday, April 16 (verified by an archived copy of the weekly television schedule published in *The Los Angeles Times* for April 15-21, 2012). It was occasionally difficult to discern whether a tweet generally praising Tupac's looks or manner was a response to the "hologram" event or the movie. Notably, a lengthy Twitter discourse related to the movie regards one physical detail not mentioned about the "hologram": a nose ring. As this was one of the earliest media representations showing Tupac with the jewel stud, it is a subject of numerous tweets and is consistently considered as a contentious contrast to his typical virility. Discussed as a sign of homosexuality (raaabiiiaaaa [@RabiiaaKhan]. 2012. "The ONLY Guy That Pulled of NOSE PIERCING was TUPAC! Any Other Guy Would look like a Queer #DefiniteNoNo !" Twitter, April 16; tld [@tfromthe6ix]. 2012. "@RileyFreemann: They only nigga that can rock a nose ring was Tupac other than that #NiggaYouGay." Twitter, April 16.), the nose ring is repeatedly given a pass because Tupac's hyper-masculinity allegedly transforms the association (Jeanmeil [@OhGreatChoice]. 2012. "Tupac was a real thug to be able to pull of a nosering." Twitter, April 16; D.MONAE [@Crownmebishh_]. 2012. "Tupac Is The ONLY Nigga That Can Have His Nose Pierced &'nd Look Right #Thats The Truth. Twitter, April 16").

[104] Nadezhda Paris (@naughtyaperez). 2012. "I'd let Tupac's hologram bang me." Twitter, April 16.

[105] . (@1OOOOOOOOO2). 2012. "I wonder how many ratchet groupies lined up backstage to get some of that hologram 2pac dick?" Twitter, April 16.

[106] Young Black Pin-Up (@Alley_Alcahuete). 2012. "For Being Dead For 16 Years, Tupac's Body Is STILL Bangin'!" Twitter, April 16.

[107] Michael Ian Black (@michaelianblack). 2012. "I'm not even going to pretend that I was less blown away by the Tupac hologram technology than I was by his abs." Twitter, April 16.

[108] Diego Teran (@diegoteran_). 2012. "Hahahahaha RT @diplo: i wish i had Abs like hologram tupac." Twitter, April 16.

News-media reports also consistently mention the abs, clothes (or lack of, i.e., "no shirt"[109]). This occurs through some sections of the data like a sporting event's blow-by-blow description of the action and each detail revealed by a different position of the seemingly spatial image. As Tupac enters the stage by appearing to rise through a trap door in the floor, for instance, his body is familiar to the Tupac widely seen as a celebrity before his death; in fact, he "looked circa 1995."[110] News reports chronicled these details, routinely describing Tupac's clothing (or lack of it) and his depicted body, mentioning that he appeared "shirtless, pants sagging," "dressed in jeans and Timberland boots" and wearing "a chain with a golden cross," with "the famous 'Thug Life' tattoo … seen clearly across his front."[111] Ultimately, "Hologram-'Pac looked as if he hadn't aged a day."[112]

One visual signifier of both Tupac's bodily status and his cultural credibility is mentioned frequently across the board in this data: Tupac's "Thug life" tattoo. The lettering inked across the rapper's lower torso can be seen through careful scrutiny of the video (pausing a frame or two helps); this is likely why many of the news-media reports mention its presence,[113] though not everyone in the crowd seems to have caught it (though they were looking: "where was his thug life tattoo?"[114]). But beyond the presence of the actual language marking Tupac's body, the continued presence of Tupac's thug-ness remained an important marker of the "hologram's"

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[109] 2012. "Oakland Rapper Tupac Shakur Comes Back From The Dead At Coachella," CBS News. April 16, https://sanfrancisco.cbslocal.com/2012/04/16/oakland-rapper-tupac-shakur-comes-back- from-the-dead-at-coachella.
[110] Robertson, James. 2012. "Tupac's return at Coachella wasn't the first: Top 10 celebrity holograms including Elvis, Sinatra and Mariah," The Mirror, April 16, https://www.mirror.co.uk/3am/weird-celeb-news/tupac-hologram-at-coachella-and-10-of- the-best-796719.
[111] Kaufman; Robertson; Osterhaut; 2012. "Rapper Tupac feiert sein Comeback als 3D-Hologramm," Musik, April 16, https://www.krone.at/318448, translated from German with Google Translate.
[112] Marantz, Andrew. 2012. "Tupac's Creepy Hologram," The New Yorker, April 16, https://www.newyorker.com/culture/culture-desk/tupacs-creepy-hologram.
[113] "… replete with Thug Life tattoos and his characteristic necklace" in Farivar, Cyrus. "Tupac 'hologram' merely pretty cool optical illusion," *Ars Technica*, April 16, https://arstechnica.com/science/2012/04/tupac-hologram-merely-pretty-cool-optical- illusion.
[114] Linette Justiniano (@MamaSroxX). 2012. "where was his thug life tattoo?" Twitter, April 16.

social identity for his viewing subjects. Much of the online discourse centers around the terms "thug" and "nigga," both colloquial reappropriations of racial pejoratives, the uses of which are highly contextual and a common discursive tool within hip-hop. Long before his "hologram" assisted in transforming the denotation of that word, the real Tupac also had been instrumental in lifting "thug" from its negative subtext (implicating specifically black criminal activity or masculine aggression) toward a more empowering meaning of "self-determination" and "defense" against racism.[115] Transportation of the word "thug" thus seems important to some fans in being able to identity the "hologram" as more than a mediated representation of its antecedent (referring to the imagery as "the *original* thug"[116]), and the revival of the #ThugLife hashtag on Twitter following the concert was often used to promote both the affective success of the performance ("boiiii thats thuggin at its best right there! #thuglife"[117]) and the potential of the "hologram" to carry Tupac's cultural legacies forward ("He is a true legend & he will live on FOREVER! #2PacBack #THUGLIFE"[118]). Likewise with the term "nigga," witnesses to the Tupac performance apply the label as a confirmation of the image-body's cultural identity and a declaration of its social acceptance. It's not just that fans identify the "hologram" as *a* "nigga"; rather, he is repeatedly tagged as "*my* nigga," claiming the digital entity not for the individual witness but for the black hip-hop culture generally.[119]

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[115] PBS Digital Studios, "Tupac Shakur on Life and Death," in *Blank on Blank* (YouTube, 2013) https://www.youtube.com/watch?v=6x2FqX2YZws.

[116] Akhil Shah (@Aks_67). 2012. "Bigup to the original thug in this joint." Twitter, April 16, my emphasis.

[117] n o r r i . ♛ (@_shvnorri). 2012. "Nigga TUPAC back . (as a hologram) boiiii thats thuggin at its best right there! #thuglife." Twitter, April 16.

[118] ... (@Shasha_Lovee). 2012. "Tupac Hologram got the world at a stand still. 6 minutes of pure legacy. He is a true legend & he will live on FOREVER! #2PacBack #THUGLIFE." Twitter, April 16.

[119] K (@kuhhsandraa). 2012. "My nigga Tupac ain't dead (:." Twitter, April 16; Just Gus (@B_GuS313). 2012. "Welcome to the new world my nigga lol." Twitter, April 16; IG:Kewats (@kewats). 2012. "My nigga 2pac!" Twitter, April 16; Will Koz (@Will_Koz). 2012. "Welcome back my nigga!" Twitter, April 16; Derrick B (@I_Move_Keys). 2012. "My nigga Tupac was at #Coachella." Twitter, April 16

Being able to hail the "hologram" this way signified for many that its imagery was not only realistic but somehow additionally real — if not a body, at least a living entity. While some witnesses still vacillated between making sense of the dead real Tupac on one hand and the live "hologram" Tupac on the other ("Wish he was still alive that's a real nigga!"[120]), others saw that the "hologram" afforded them the chance to declare (outside the context of the aforementioned conspiracy theories) that Tupac "ain't dead" and that this Tupac is "the coolest nigga alive."[121] Many spectators, in fact, proclaimed the "hologram's" cultural reality to be significantly superior to living "thugs" and "niggas." Most of these judgments were levied artistically, implying a common negative view of the state of hip-hop in 2012 — the "hologram" of Tupac "performs better than some rappers I've seen," "is still better than most MC's out now," and came off "more real then most of these Niggas in the game today," despite his questionable mortality[122] — and even shaming Snoop Dogg, the very rapper sharing the stage with the "hologram" ("it was hard to tell which was the lifeless, one dimensional one"[123]). Some of them, however, brought Tupac's credibility offstage, as well, as a benchmark for performances of self in everyday life: "The tupac hologram is more real than the fake niggas at my school."[124] That kind of discourse is key to the success of the "hologram" passing not only as an onstage performer in the specific context of the concert stage but as a public persona in the wider culture.

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[120] brii (@bribrihollywood). 2012. "That Tupac hologram got me all excited. Wish he was still alive that's a real nigga!" Twitter, April 16.

[121] K (@kuhhsandraa). 2012. "My nigga Tupac ain't dead (:." Twitter, April 16; Hector (@1Tego_). 2012. "Tupac the coolest nigga alive." Twitter, April 16.

[122] VinceValholla (@VinceValholla). 2012. "2Pac's hologram performs better than some rappers I've seen…" Twitter, April 16; TheRealCeltic (@therealceltic). 2012. "That 2PAC Performance was incredible. Even as a hologram, he is still better than most MC's out now." Twitter, April 16; ooretada (@GMooreta). 2012. "2pac as a hologram still more real then most of these Niggas in the game today." Twitter, April 16; Mark (°ʖ̯°) (@LumpiaLover_420). 2012. "tupac came back from the dead for like 5 minutes and still performed better than the most successful rappers today." Twitter, April 16.

[123] boo (@aidan__m). 2012. "The thing about that Snoop vs Tupac hologram was that it was hard to tell which was the lifeless, one dimensional one." Twitter, April 16.

[124] Dame (@daniel6morales). 2012. "The tupac hologram is more real than the fake niggas at my school." Twitter, April 16.

The "hologram's" spectrality, however, may not afford it the ability to "ghost" from the negative social effects of being identified as a black man in America. Any new life that holosubjects envisioned for this entity often was expressed as being subject to the same perils that plagued the human Tupac. The pervasiveness of these social realities even prevented some from accepting the full reality of the "hologram": "I believe 2Pac is dead because if he was alive that nigga would be in prison for false claming death."[125] Worse than prison, many spectators resigned the "hologram" Tupac to the same social violence as the physical black body. Several fans made light of mirroring the news from 16 years earlier: "Hologram Tupac was shot backstage" and "breaking news: the tupac hologram that showed up at coachella yesterday has been shot and is in critical condition").[126] Such extension of social agency even extended to potential perpetrators, with one fan suggesting that not only had the "hologram" of Tupac been shot but that another digital entity was sought as "a 'hologram of interest,'"[127] and another turning the real 1996 crime into an opportunity for vengeance by whatever reality the "hologram" represented: "what if the guy who shot tupac was at coachella? You know that nigga was shitting bricks."[128] Expressions like these surely were performative attempts at levity (the *lingua franca* of much online social-media discourse), but they nonetheless reveal openings for discursive impacts and ways that meanings are made from such phenomena. Particularly in that last tweet — the potency is less in some actual scifi suggestion that Tupac's "hologram" might stalk the crowd and win retribution against his real murderer than it is in the implication that this

[125] pineapples **(**@KashNKats). 2012. "I believe 2Pac is dead because if he was alive that nigga would be in prison for false claming death." Twitter, April 16.
[126] wolf (@2016WasTrash). 2012. "Niggas said Hologram Tupac was shot backstage :'(." Twitter, April 16; longboat (@SirTomWhiteside). 2012. "breaking news: the tupac hologram that showed up at coachella yesterday has been shot and is in critical condition." Twitter, April 16.
[127] The Wolf of NASCAR (@CitizenKBA). 2012. "Biggie Smalls now being called a 'hologram of interest' in death of Tupac hologram." Twitter, April 16.
[128] Keira (@_KeiraNicole). 2012. "LOL! I'm Just Too Done! RT @EddieVill2: what if the guy who shot tupac was at coachella? You know that nigga was shitting bricks." Twitter, April 16.

technical image wields an affective power somehow different from or greater than traditional imagery. In this case, the "guy who shot tupac" is a quintessential holosubject, in that the spectator insinuates that the Tupac imagery not only affects the murder's thoughts and emotions (recognizing the digital entity as his real victim and potentially experiencing visceral fright and guilt) but also — the phrase "shitting bricks" intimating an imminent escape — activates and moves his body. One might not imagine a guilty murderer fleeing a painting of his victim, but the suggestion that digital Tupac might manifest as both another victim of violence as well as a perpetrator of it helps settle the plausibility of one high-tailing it from a "hologram." As some spectators of the original Pepper's Ghost were reported to have fled the Polytechnic theater for fear of seeing *a ghost*, here the "hologram" has situated itself with an actual human identity so that someone might run not from any ghost but from *Tupac*.

New séances for reviving the performative persona

What, then, is revived by the Tupac "hologram"? Not the actual body, certainly, but another kind of body — the technical image that is already known by the public and has passed on behalf of humans for many years successfully — *enough* for mediated exchanges. Most spectators, for instance, did not know Tupac as a person at all; they only knew him as part of his managed social identity, as a sizeable series of historically mediated, technical images. 2.0Pac did not resuscitate a dead body, but as technical imagery it revived, situated, and temporarily fixed the media image of that body that its fans had encountered within other mediated contexts (as a magazine photograph, an album cover, a television interview, a music video) and the "hologram" simply made a bid to include the live concert as yet another context for the same mediation. The "hologram's" liminal but still identifiable figure, then, participates in a conjuring

of a person's existing persona, raising it from digital archives, breathing new life and agency into it — life and agency different from traditional imagery or even previous screened imagery by virtue of the "hologram's" simulation of bodily presence — and constructing fresh séances specifically for this practice.

A relevant distinction between person and persona in modern mediated experience is at the core of Philip Auslander's theory of performance, specifically within his focus on the "visual aspects of musical performance, by which I mean its physical and gestural dimensions."[129] Auslander's work attempts to settle common concerns within performance studies about the "confusion of realms" between live and mediated events[130] and to map the spaces between "lively" performance and "petrified" visual media[131] (or even more recent attempts to delineate between "corporeal liveness" and "virtual liveness"[132]). For Auslander, the presentation of a mediated image not *of* performance but *as* performance retains many novel and immediate

[129] Philip Auslander, "Musical Persona: The Physical Performance of Popular Music," in *The Ashgate Research Companion to Popular Musicology*, ed. Derek B. Scott (Farnham & Burlington: Ashgate, 2009), 303. In this article and throughout his considerable work about musical personae, Auslander is addressing the fields of music studies and musicology, encouraging those scholars to see as well as hear, insisting that music involves much more situated and fully embodied experience than only the aural. I align his efforts here to those W.J.T. Mitchell communicating to visual studies that even imagery must account for other senses and a broader scope of experience — i.e., "There Are No Visual Media," in *The Visual Culture Reader*, ed. Nicholas Mirzoeff (London & New York: Routledge, 2013). Auslander's focus on pop music performance is key to mine here, as it departs from previous perspectives in music philosophy by Theodore Gracyk (*Rhythm and Noise: An Aesthetics of Rock* (Durham, N.C.: Duke Univ. Press, 1996)) and cultural studies by the likes of Lawrence Grossberg, who has argued that pop concerts are merely after-images of the material contained in previous sound recordings ("Reflections of a Disappointed Popular Music Scholar," in *Rock over the Edge: Transformations in Popular Music Culture*, ed. R. Beebe, D. Fulbrook, and B. Saunders (Durham, N.C.: Duke Univ. Press, 2002)). Auslander acknowledges that fans may have experienced music via sound recordings and other videos prior to a live performance but insists that even those experiences are embodied in certain ways and that "regardless of the ontological status of recorded music, its phenomenological status for listeners is that of a performance unfolding at the time and in the place of listening" ("Performance Analysis and Popular Music: A Manifesto," *Contemporary Theatre Review* 14, no. 1 (2004): 5).

[130] H. Blau, *Blooded Thought: Occasions of Theatre* (New York: PAJ Press, 1982), 113.

[131] H. Molderings, "'Life Is No Performance': Performance by Jochen Gerz," in *The Art of Performance: A Critical Anthology*, ed. G. Battcock and R. Nickas (New York: E.P. Dutton, 1984).

[132] Paul Sanden, "Virtual Liveness and Sounding Cyborgs: John Oswald's 'Vane'," *Popular Music* 31, no. 01 (2012).

aspects of liveness.[133] Less concerned with the ontology of any related imagery, Auslander focuses on the phenomenology of the situated event — that mediated performance may be experienced or *seen* as live[134] and that media and bodies now coexist within a hybrid circumstance he calls "intermedial performance."[135] A "hologram" like Tupac, then, operates as just such an intermediary between not just states of being but contexts of social identity, and his audience participates in the passing essentially by recognizing his liminal status and affording it entry into the sanctioned space of the stage.

The persona, for Auslander, is a particular role inhabited by the performer — "a liminal phenomenon" and a transmedia public image (in accordance with Henry Jenkins' proposed fluidity of "transmedia" culture[136]), co-produced by the person, the audience, and the professional producers and media contributors surrounding the performer ("performers are not the sole authors of the personae they perform in these many contexts"[137]). This does not necessarily imply that a persona is merely an image constructed by marketers for capitalist control; Auslander not only includes fans in the production of personae but stresses the *artistic* aspect of its creation and projection, as well. Persona is an image, less in the strict visual sense and honing more to the idea of a general public impression; Auslander even calls it "an impression," but, again, a *public* one — concepts of persons that are "created both aurally and

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[133] See also earlier work by Nick Couldry, in which he determines that "the decisive criterion of liveness, is not the factuality of what is transmitted, but the fact of live transmission itself." (Nick Couldry, *Media Rituals: A Critical Approach* (London: Routledge, 2003), 96).
[134] Philip Auslander, "Against Ontology: Making Distinctions between the Live and the Mediatized," *Performance Research* 2, no. 3 (1997).
[135] Philip Auslander, "Liveness, Mediatization, and Intermedial Performance," *Degrés: Revue de Synthèse à Orientation Sémiologique*, no. 101 (2000).
[136] Henry Jenkins, *Convergence Culture: Where Old and New Media Collide* (New York: New York Univ. Press, 2006).
[137] Auslander, "Musical Persona: The Physical Performance of Popular Music," 308.

visually and imply a social narrative"; indeed, they present "the performer as social being."[138] The persona is different from the actual person's presentation of self in everyday life. It's a distinct social being that is turned on during — or *projected into* — specific situations. The persona is the constructed, not-quite-fictional "performed identity"[139] that the public sees and has access to — Woody Guthrie as hillbilly, Madonna as wanton, or Tupac as thug.

The work done by that persona in life *or* death, however, may have positive or negative social impacts. A digital extension of that persona risks the continuation (or the spotlighting) of social stereotypes and racial tropes, which is another way the selection of Tupac for this presentation complicates matters. These shades of the Tupac "hologram" came to light beyond the 24-hour window of this data set, as the tone of reportage, comment, and criticism of the Tupac "hologram" began to darken considerably. As one Canadian critic predicted the phenomenon's overall affective trajectory, "First, there was jubilation," but "then came the creeped-out, sober second thoughts."[140] Another critic agrees that the phenomenon indeed extends Tupac's persona but dilutes it in the process, making Tupac "a human being turned cultural icon turned image-of-a-cultural-icon, until any connection we once could have had to the original becomes irrelevant."[141] Scholarship about the Tupac "hologram" since has divided itself between continuations of Matthew Harris' likening of the figure to a saintly relic[142] and, particularly in the wake of the more recent Black Lives Matter social movement, considerations of the "hologram's" promotion of hegemonic racial ideologies. By drawing only upon imagery

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[138] Ibid., 305.

[139] Philip Auslander, "On the Concept of Persona in Performance," *Kunstlicht* 36, no. 3 (2015): 76.

[140] https://www.theglobeandmail.com/arts/music/hologram-tupac-whats-so-live-about-live- performance-anyway/article4170573/ Hologram Tupac: What's so live about live performance anyway?, J. Kelly Nestruck Published April 16, 2012.

[141] Charlie Jones, "The 2.0pac Hologram Was Really, Really Weird," *Dummy*, April 20 2012.

[142] See Michael Ralph, Aisha Beliso-De Jesús, and Stephan Palmié, "Saint Tupac," *Transforming Anthropology* 25, no. 2 (2017); Alicia Spencer-Hall, "Post-Mortem Projections: Medieval Mystical Resurrection and the Return of Tupac Shakur " *Opticon1826*, no. 13 (2012).

and identity markers from the past, the potency of the "hologram" too easily reinforces old tropes and may freeze a person's persona in a previous social status. Laura Glitsos argues in a new book that "the activation of a dead man's ghost under the complete control of another individual or group, such as one would a marionette"[143] doesn't revive the individual or even his persona as much as it does this nation's propensity for appropriating black bodies and marginalizing them as the Other — as non-bodies. "[W]hat is Tupac's hologram," she asks, "but an attempt, both produced by light and veiled by that very technicity, to resurrect the labor value of the black male body?"[144] She cites David Marriott's earlier study of the spectrality of modern black visual culture, in which he critiques what he calls "teletechnology" (essentially, technical-image apparatuses) and its inherent functions of maintaining "the commodity value of black death-in-life."[145] In the very veiling of the apparatus that Flusser also recognizes as the pivot point upon which a technical image could swing toward more discursive or dialogic communication, what winds up hidden from the holosubject in this situation can be, for Marriott, the continuing "terrors of colonial slavery," which he says "remain unseen, lastingly virtual" and — using an adjective endemic to the digital specter itself — "ungraspable."[146] Presaging similar ideas about sociological hauntings published by Avery Gordon the following year,[147] Marriott adds, "In a grievance like this, the enslaved dead cannot be lamented because they have no witnesses."[148]

The digitized dead, however, have had many witnesses since the technical resurrection of Tupac's performing persona. During the previous decade, many more "holograms" have

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[143] Laura Glitsos, *Somatechnics and Popular Music in Digital Contexts*, ed. Steve Clark, Tristanne Connolly, and Jason Whittaker, Pop Music, Culture, and Identity (Cham, Switzerland: Palgrave Macmillan, 2019), 138.
[144] Ibid., 139.
[145] David Marriott, *Haunted Life: Visual Culture and Black Modernity* (New Brunswick, N.J.: Rutgers Univ. Press, 2007), 17.
[146] Ibid., 5.
[147] Avery F. Gordon, *Ghostly Matters: Haunting and the Sociological Imagination* (Minneapolis & London: Univ. of Minnesota Press, 2008).
[148] Marriott, 5.

followed in a similar vein. Michael Jackson has been revived twice: once for a worldwide television broadcast of the annual Billboard Music Awards, in which Jackson's digital body danced with real dancers, and again for a penultimate number during the ongoing *Michael Jackson: ONE* show by Cirque du Soleil in Las Vegas.[149] Roy Orbison, Buddy Holly, Frank Zappa, and Ronnie James Dio each have mounted new tours that earned "respectable money."[150] The summer following Tupac at Coachella, two more deceased rappers, Ol' Dirty Bastard (ODB) and Eazy-E, were revived as holograms — with extra infusions of persona-lity. While Tupac's digital voice was an aggregate of existing sources and his on-stage movement was modeled by a mimic through cinematic motion-capture techniques, Eazy-E's hologram voice was sampled from one of his sons, his face featured features copied from his daughter's, and his movements were captured from his other son; holo-ODB, meanwhile, was marinated with similar vocal and bodily data from his son, Young Dirty Bastard (YDB, nee Barson Jones).[151] Producers of both hologram performances routinely discussed the imagery itself as a kind of reverse offspring — digital re-inheritors of innate personal traits (selected for continued commercial survival). "There's digital DNA infused into these projects," said director Chris "Broadway" Romero, while Chang Weisberg, founder of the Rock the Bells hip-hop tour on which these holograms appeared in five U.S. cities, claimed, "The actual DNA of these avatars is

[149] Michael Jackson, "Michael Jackson - Slave to the Rhythm," (YouTube, 2014); Allison Duck, "Leap into a Legacy at 'Michael Jackson One'," *Las Vegas Magazine*, May 24 2019.
[150] Andy Greene and Kory Grow, "The Sudden, Lucrative Gold Rush for Old Music," *Rolling Stone*, June 8 2021. See also other related blog posts of mine, such as some thick description of the Ronnie James Dio hologram show (https://www.thomasconner.info/blog/computer-god-the-ronnie-james-dio-hologram) and a severe critique of the Zappa hologram's slavish realism (https://www.thomasconner.info/blog/realism-to-art-holograms-of-zappa-and-madonna).
[151] Alexandra Cheney to Speakeasy, 2013, http://blogs.wsj.com/speakeasy/2013/08/22/easy-e-ol-dirty-get-hologram-treatment-could-steve-jobs-be-next/.

comprised of the family members of the late rappers."[152] For ODB's son, though, the project only highlighted the interplay of biological and technological manifestations of his late father. YDB (whose real middle name is Unique) already had been performing as an ODB tribute act — a kind of traditional public performance preceding these new hologram versions — and often spoke of the project as life-affirming for *both* generations: "I'm satisfied with my life because my father was something great on the planet. Now we're about to bring him back, you know what I'm saying? Back into existence."[153]

[152] Rob Markman, "Eazy-E and Odb at Rock the Bells: The Secrets Behind Their Holograms," *MTV News* (2013), http://www.mtv.com/news/articles/1713690/eazy-e-ol-dirty-bastard-rock-the-bells-hologram.jhtml; G.D. Kennedy, "Rock the Bells 2013: Eazy-E, Odb Brought Back to Life by Their Kids " *The Los Angeles Times*, Sept. 7 2013.
[153] guerillanation, "Virtual Performances - Episode 1," in *Behind the Scenes* (YouTube, 2013).

Conclusion:
The auto-iconic futures of holopresence

> I'm looking through you, where did you go?
> I thought I knew you, what did I know?
> You don't look different, but you have changed
> I'm looking through you, you're not the same!
> — *The Beatles, "I'm Looking Through You"*

As the cases in this dissertation have shown, periodic and historically situated emergences of technical imagery that projects or at least strives for the appearance of embodied figures are renegotiating human relationships with imagery and rearranging the spaces in which their encounters take place. Potential viewing subjects for such imagery have been presented pedagogical performances of how a holosubject might interact and communicate with "holograms" both on the stages of the Royal Polytechnic Institution in Victorian London (where John Henry Pepper's formalizing of an optical illusion into the Pepper's Ghost spectacle relocated concepts of the spectral into products of rational technoscience) and in visual depictions of human-"hologram" sociability within late 20th-century science-fiction narratives. At the Museum of Holography in New York City, prospective holosubjects were afforded opportunities to enter the space of holopresence in order to embody and practice new methods of connecting and communing with the phantasmal figures of optical holograms, and once connotations of holography's spectrality began to materialize as digital "holograms," Pepper's Ghost was revived in the 21st century for a popular, public resurrection of a poignant choice of pop star.

While the research in this dissertation originally was inspired by my own journalistic experiences with and curiosities about these and other emerging hologram performers (including

Japanese Vocaloid stars such as Hatsune Miku), any carefree considerations of their implications have darkened somewhat during the final stages of this project, which is being completed in mid-2021 amid the worldwide coronavirus pandemic. During the last year and a half, efforts to control the spread of the disease, such as social distancing and mandatory lockdowns, have rearranged human relationships with each other, as well as with the numerous digital devices, services, and networks now relied upon to stand in for and facilitate certain aspects of interpersonal communication. Decades of theories about digital technology's expansions of and constraints upon human communication have become less academic, as it were, crystallizing and concretizing amid urgent, real-world struggles as COVID-19 protocols precipitated serious appraisals of "holograms" as potentially life-saving alternatives to material engagements. Early in the outbreak, for instance, when virus transmission still was believed to occur primarily via surfaces, a China newspaper reported a surge of new orders for "holographic" buttons, which allowed users to interface with elevator and ATM keypads by "touching" projected surfaces rather than actual ones.[1] The immaterial aspect of technical imagery was deployed as a tool to maintain material interactions and save lives.

Pandemic protocols additionally have broadened the public scope of this dissertation's scrutiny of what it means to live between worlds and the limits of the "real" when it comes to emotional and physical authenticity. Fellow educators have been challenged to meet pedagogical expectations in classes shifted to online instruction. Friends and colleagues were uprooted from the material gathering spaces of water coolers and favorite hangouts. Loved ones were confounded by longing for each other's visceral human presence via telecommunication systems that offer only another digital image on a ubiquitous flat screen. Digital teleconferencing apps

[1] Xinmei Shen, "Elevator in China Uses Holographic Buttons Amid Coronavirus Outbreak," *South China Morning Post*, March 6 2020.

such as Zoom worked valiantly to fill some of the gaps and kept students, workers, and acquaintances connected — to a point. But within months of trying to map the material, physical, spatial, and geographical dimensions of pre-existing social lives onto the invisible infrastructures and fixed displays of internet technologies, many began to express that screens simply weren't *enough* for certain communications. The virtuality of the image behind the screen — indeed, the apparent barrier of the screen itself — amplified aspects of the other person's absence. Employees and teachers expressed frustration over the lack of dimensional, physical presence delivered via live digital video. "I can't read [students'] body language and help them feel comfortable in the way that I can when I'm there," said one professor,[2] while magazines and websites began offering advice on how to counteract this seemingly in-built aspect of the media ("5 Top Physical Presence Tips For Virtual Success"[3]). I, for one, have been deeply grateful to be able to FaceTime with my elderly mother (and thankful not to have experienced such mass shutdowns during a pre-internet era) but, as a scholar studying histories and imaginaries about technologies for different ways to produce and mediate another's physical presence, my own ache for the general unavailability of such shared spaces has only deepened. Pandemic social distances have problematized the personal presence offered by omnipresent digital screens.

Amid these concerns, the mythical "hologram" has been newly positioned as a potential panacea for "Zoom fatigue" and a way to restore the loss of personal presence felt by the rise of teleconferencing. As this research arrives, "holograms" are a buzzword once again — so much so that it's here we might *finally* let go of the "scare quotes," as the term itself has rematerialized (precisely as this dissertation's historical arc has shown) into a consistent, colloquial signifier of the scifi imaginary made real and, according to so many recent news reports, now looms as a

[2] Ashley Fetters, "We Need to Stop Trying to Replicate the Life We Had," *The Atlantic*, April 10 2020.
[3] Maria Tecce, "5 Top Physical Presence Tips for Virtual Success," *Business 2 Community*, June 29 2021.

natural heir to existing, everyday communication media. Assisted by yearnings for projection of a more high-presence technical image, numerous companies building hologram devices have launched or raised their public profiles during the previous year. In January 2021, Imverse was hailed with scifi superlatives for its spatially rich image-capture software ("We beam people as Live 3D holograms") and, that same month, ARHT Media launched its HoloPod, a large screen that reproduces a 3D image of a person as a virtual hologram (an experience they label, *ahem*, HoloPresence)[4]. Google and Microsoft followed with Project Starline and Mesh, respectively, each offering "a video-chat system with screens that give participants three-dimensional depth" and, according to a participating venture capitalist, "a new style of communication, where you'll have better, more frequent interactions."[5] Few startups have received more media attention (or more seed money[6]) during the pandemic than PORTL, a device the shape and size of (ironically?) a phone booth, into which the absent teleconferencer is materialized in 3D with remarkable resolution and at least a simulation of parallax. By this summer, the company's device was profiled in numerous publications, billed as a refreshing alternative to Zoom's traditional telepresence; a piece in *The New York Times* name-checks both Pepper's Ghost and Tupac Shakur as it praises the PORTL holograms' ability to re-create additional dimensions of a person's presence, to offer "a close-up view" of each other "at eye level," and to be so convincing that spectators instinctively attempt a handshake.[7] Like virtual artworks at the Museum of Holography, the glass of PORTL hologram booths may be smudged with the fingerprints of emergent holosubjects trying in vain to touch the ghosts in these machines.

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[4] See the commercial websites for Imverse, https://www.imverse.com/, and ARHT, https://www.arhtmedia.com/, both accessed July 22, 2021.

[5] Ann-Marie Alcántara, "Tech Companies Want to Make Holograms Part of Routine Office Life," *The Wall Street Journal*, June 9 2021.

[6] Elijah Chiland, "Hologram Company Portl Gets $3 Million," *Los Angeles Business Journal*, Nov. 2 2020.

[7] Victoria Gomelsky, "Holograms: A Way to Be There in Spirit, If Not in Body," *The New York Times*, June 18 2021.

The headline of that same *New York Times* story heralds the digital hologram as "A Way to Be There in Spirit, if Not in Body," and, as I have claimed throughout this dissertation, the spectral form of the historical hologram routinely revives spiritualist discourse and practices. A recent magazine article situates holograms within "a new era in technology-enabled Spiritualism" (suggesting that today's interest in spectral holograms correlates with another surge in popular spiritualism a century earlier during the previous global pandemic of the Spanish flu) before surveying the aforementioned post-Tupac parade of posthumous performer holograms. In October 2020, the rapper Kanye West gifted his wife with a five-minute hologram of her dead father, whose digital ghost materialized at a party, saying, "I watch over you and your sisters and brothers and the kids every day"[8] — something one might expect a conjured ghost to say to his family, but also an implication of the interactive nature of spectral holopresence. That is, the technical image is positioned in the encounter as more than an object only to be viewed. The holosubject sees the hologram, but is also seen by it.

The contemporary hologram asserts its own spectrality as both a form of death *and* life. Often classified, as we've seen, as a ghost, the digital hologram participates in signifying spectrality but offers subjects additional opportunities to experience and even shape their own spectral form and rehearse human-specter interactions *before* death — to see how their own ghost might be seen. Contributing to such spiritualist revivalism but also continuing the transportation of the mythical scifi hologram back to real-world technocultures, none other than William Shatner, who has portrayed Capt. James T. Kirk throughout the *Star Trek* television and film franchise since the late 1960s, spent five days in early 2021 capturing his 3D visual likeness and recording answers to a wide variety of questions for a service called Storyfile. A resulting

[8] "Kanye West Gives Kim Kardashian Birthday Hologram of Dead Father," *BBC News*, Oct. 30 2020.

hologram of Shatner currently is in production and furthers the potential relationship between humans and technical imagery by virtue of its being functionally interactive: spectators of the hologram may ask Shatner questions, which artificial intelligence will process in order to tag and replay the appropriate prerecorded response.[9] Such a facsimile of dialogic communication is not "live" in a corporeal sense but at least seems moreso in an everyday performative sense. In addition, the Shatner hologram never has been framed in news reports as a mere labor-saving, telepresence device for, say, a 90-year-old actor still in demand to attend scifi conventions; rather, the reports routinely discuss the technical image's inherent capability for life extension — a strange new world in which "[g]enerations in the future will be able to have a conversation with him,"[10] a new life of "immortality" and a civilized "triumph over death itself,"[11] an opportunity for him to keep boldly going "even long after he passes on."[12]

Driven by the reality of impending death, such a project seeks to capture and archive an individual's likeness and memory, but also to add an embodied dimension to that likeness and to produce opportunities for interaction with the subject within a specific discursive frame. Quizzing a William Shatner hologram about the cultural impact of *Star Trek* certainly extends the participation of his persona in cultural and commercial spaces, but other uses of existing 3D technical-image systems position a person's posthumous presence more politically. Take the New Dimensions in Testimony project, a holographic extension of the USC Shoah Foundation's ongoing efforts to capture and archive the narratives of Holocaust survivors. Launched in 2012 — the same year as Tupac Shakur's hologram resurrection — NDiT employs archiving and

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[9] Rollo Ross, "Ask Him Anything: William Shatner's Life Story to Live on through Ai," *Reuters*, March 26 2021.
[10] Kathryn Ingate, "William Shatner: Star Trek Actor, 90, Plans to Beam 3d Hologram of Himself on Gravestone," *The Daily Express*, May 20 2021.
[11] David James, "Star Trek's William Shatner Is Having His Personality Copied into an Ai," *We Got This Covered* (2021), https://wegotthiscovered.com/movies/star-treks-william-shatner-live-death-ai/.
[12] Mike Elgan, "How Holograms, Deepfakes, and Ar Are Raising the Dead," *Fast Company*, May 5 2021.

projection processes similar to Storyfile's. For instance, the first Holocaust victim imaged for NDiT, Polish survivor Pinchas Gutter, sat for five days surrounded by an array of lights and two dozen cameras, answering nearly 500 questions about his life and WWII experiences. The resulting hologram can be projected using a Pepper's Ghost system so that Gutter may appear in classrooms and lecture halls, appearing to sit in a chair within that same space and available to answer questions; Shoah executive director Stephen Smith even has described the process as "one step further as far as you won't be projecting onto a screen, you'll be projecting into space"[13] — a spiel that is, as we've seen, not technically accurate but continues the mythology of the scifi imaginary examined in Chapter 3 and the real-world work that imaginary does in positioning hologram ghosts as natural presences among humans.

But by embodying the survivor narratives as hologram figures (in addition to Shoah's usual methods of committing the stories to text and traditional video), NDiT seeks to maintain an interpersonal impact carried by the person's realistic form and to utilize the power of this presence to keep survivor stories in circulation, supporting anti-genocide discourses, after the death of the survivor and the body that naturally wields that communicative power. NDiT is pitched as both "a groundbreaking project that enables audiences to have a 'virtual conversation' with projected images" of survivors and "a valuable tool to ensure future generations will be able to have personal interactive experiences" with them. A 2016 press release celebrates a pilot study in which students interacted with the Gutter hologram — not so much to examine any Uncanny Valley-leaping believability of the image itself but to quantify the social traction of Gutter's specific stories and overall moral compass. This is marked out by statistics reporting 100% "connections to the technology," 97% "connections to the person," and 68% "positive change in

[13] John Rogers, "Stories of Holocaust Survivors Retold by Holograms," *Associated Press*, Feb. 2 2013.

participants" — by which the latter means "positive outcomes that are consistent with the USC Shoah Foundation's Theory of Change," which "asserts [that] by engaging with testimonies, people gain understanding and skills that motivate and inspire them to be more responsible citizens in society."[14] Here is the reality-augmenting aspect of overlaying space with imaging that I have discussed in my Introduction and elsewhere[15] — an inherent ideological potential of the hologram writ large, or at least life-size. The spatial dimension and amplified personal presence of holograms possesses the capability to project physical likeness into everyday realities as well as to participate in discourses and meaning making. For indication of the open mixture of visual imagery and ideological impact intended by this specific project, look no further than to the name of the company from which the original idea for NDiT emerged: Conscience Display.[16]

At the Illinois Holocaust Museum and Education Center in Skokie, Ill. (the site of the above NDiT pilot study), a bespoke experience has been constructed especially for the regular presentation of Holocaust survivor holograms. Opened in 2017, the Abe & Ida Cooper Survivor Stories Experience is a 66-seat theater created in conjunction with the Shoah Foundation and equipped with a state-of-the-art digital Pepper's Ghost system that projects the holograms of a dozen Jewish people (as of this writing, 27 survivors have been imaged by NDiT as hologram storytellers in six languages) to regular visitors and school groups. It is the first permanent exhibit space for holograms of this kind — a museum of *new* holography — and exists as a less-uncanny haunted house or phantasmagoria, in which the ghosts are sanctioned and benevolent

[14] "New Dimensions in Testimony Proven to Be Valuable Educational Tool," news release, June 21, 2016, https://sfi.usc.edu/pressroom/releases/new-dimensions-testimony-proven-be-valuable-educational-tool.
[15] See also Thomas Conner, "Pepper's Ghost and the Augmented Reality of Modernity," *Journal of Science & Popular Culture* 3, no. 1 (2020).
[16] The company has gone inactive but its website is archived consistently at archive.org; see https://web.archive.org/web/20190411203337/http://www.consciencedisplay.com/home-page.

while the tales they tell index their horrors within all-too-real human history, with the idea that experiencing these seemingly intimate interactions might impress future generations into *avoiding* those very horrors. Museum CEO Susan Abrams was frank with The Chicago Tribune about the temporal, discursive aims of the project, as well as the essential death drive that fuels it, stating that the holograms allow the museum to continue telling survivors' stories "going forward, when we're not privileged to hear from the survivors."[17] The Tribune's columnist even doubles down on the blend of personal presence projected by the technology and its lasting impact on Holocaust discourse, referring to the imagery as "mesmerizing" but also "perpetuating not only the survivors' testimony but also their facial expressions, tone of voice, body language — personal characteristics that render their truths palpably real and compelling."[18] In other words, the physical reality of the imagery — as it boosts or at least maintains and extends the spatial presence of the hologram's antecedent subject — is inextricably bound up with the values placed on its messaging.

As a space purpose-built for the display of this kind of illusion, the museum's theater realizes Henry Dircks' original, 19th-century architectural plan for the system John Henry Pepper downsized and made portable for his namesake London spectacle in Chapter 1. But an additional 19th-century precedent exists here — not just for the manifestation of a technical image of the dead but for this modern penchant for harnessing technoscience to maintain the active, embodied participation of a posthumous person within daily social life, including a related mixture of conversation and live performance. A few years before the opening of the Royal Polytechnic Institution and a couple of decades before Pepper's Ghost (and, incidentally, a decade and a half after the publication of Mary Shelley's *Frankenstein*), another Londoner, the philosopher Jeremy

[17] Howard Reich, "How to Talk to Holocaust Survivors in the Future? In Take a Stand's Holograms, an Answer," *The Chicago Tribune*, Oct. 21 2017.
[18] Ibid.

Bentham, penned a final manuscript before dying in 1832 in which he proposed an extraordinary, "analog" project for constructing a technically actualized form of a person and projecting it forward in time after death.

Bentham's essay, "Auto-Icon; or, Farther Uses of the Dead to the Living,"[19] remains an extraordinary consideration of using technology to maintain both the presence of the dead and their participation in material social exchange. Coining the term, Bentham's *auto-icon* is a person's own body preserved in part or in whole[20] for display, use, and continued interpersonal interaction after death. His idea was not to embalm for the sake of lying in state, displaying a tranquil aesthetic of the dead body with eyes closed and a peaceful countenance — to be looked *at*. Rather, Bentham's auto-icon sought a virtual re-animation of the actual body within social spaces and, barring actual movement, at least a refiguration and repositioning of the body so that it might continue to participate among and communicate with the living. He became his own example. The terms of his will directed that his head and skeleton be preserved and "put together in such a manner that the whole figure may be seated in a chair usually occupied by me when living, in the attitude in which I am sitting while engaged in thought in the course of time occupied in writing."[21] This was mostly accomplished — the bones inserted into a stuffed effigy costumed in Bentham's clothes, though a botched procedure in preserving the head led to a frequent wax replacement — and on and off for more than a century and a half Bentham's figure has sat in that position on public display at the south end of the Cloisters at University College

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[19] Jeremy Bentham, "Auto-Icon; or, Farther Uses of the Dead to the Living," in *Bentham's Auto-Icon and Related Writings*, ed. James E. Crimmins (Bristol: Thoemmes, 2002 [1832]). Surprisingly, this is the first official publication of this extraordinary Bentham text. The title uses "Farther" to distinguish and extend its ideas from a separate pamphlet titled "Use of the Dead to the Living" (Ibid., 2002 [1827]) by Bentham's confidant and physician, Southwood Smith, which defends the utilitarian benefits of cadaver dissection.

[20] Bentham suggests auto-icons of full bodies — or just heads, with either collected in public displays and "entire museums" (ibid., 8.), reminiscent of the Head Museum in the animated TV sitcom *Futurama*!

[21] "Will of Jeremy Bentham, 24 August 1769 ", in *The Correspondence of Jeremy Bentham Vol I: 1752-76* ed. Timothy Sprigge (London: Athlone, 1968).

London, to which it was donated in 1850. Today, Bentham remains a popular tourist attraction, with thousands not just stopping by to see the body as a curious attraction but also making the pilgrimage to *visit* Bentham.[22]

The term *auto-icon* turns Cartesian dualism on its head, fusing individual identity strictly to the material body, so that one's self is never absent from the body — the self (*auto*-) possesses the icon. Importantly, he did not call it the auto-*index*, because Bentham's effigy addresses the mimetic faculty rather than being indexical, but like a hologram this mimetic faculty is meant to be *seen through* so that the effigy itself is recognized not as an object but as the original subject ("Is not identity preferable to similitude?" he asks[23]). This weighs the auto-icon with authenticity: "Auto-Icons cannot be invented, cannot be forged."[24] The auto-icon then is not a representation *of* one's bodily self but one's bodily self *as* representation. Bentham thus envisioned myriad, active ways this new self might continue participating in social life, including his own. (An urban myth long has suggested that, also per Bentham's dictates, the auto-icon be removed from its wood-and-glass display case to preside over and even vote at various UCL board meetings, though this actually only occurred once in 2013.[25])

Holograms themselves, as I have shown, are discussed in discourses seeking to satisfy goals similar to the auto-icon. Bentham recognizes that in order for the auto-icon to continue participating in life — or especially to *perform* — they will have to become animated, which will require "machinery" or technology. Much of Bentham's essay dwells on an idea to cast auto-

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[22] In September 2017, I did so myself, noting with some fascination that as I approached the open box I instinctively removed my cap, an ingrained social habit in the presence of other living souls, while other visitors I observed seemed to experience something slightly uncanny but often summoned the steel to speak to him, even asking him questions ("Is this *really* what you wanted?" one woman sighed).

[23] Bentham, 3.

[24] Ibid., 5. In this sense, auto-icons are holographic, in terms of the original meanings of a textual holograph (a document written in whole by hand, thus resistant to counterfeit) or related to optical holography's widespread usage in anti-counterfeit security, such as credit cards.

[25] Etan Smallman, "181-Year-Old Corpse of Jeremy Bentham Attends Ucl Board Meeting," *Metro*, July 12 2013.

icons in theatrical performances, in which the remains would be animated by children strapped to the backs of the desiccated corpses in order to make them move and walk, like marionettes. Also, "the eyelids might be made to move" and maybe even, in order be "keeping up the illusion," hands and feet, too. The auto-icon could be made to speak "by well-known contrivances."[26] This section of the text reads like the minutes of a 21st-century special-effects meeting, discussing motion-capture and voiceovers. The goals are similar: while Bentham trots the actual body out and about, digital holograms present representations of the body via apparatuses that are hidden and meant to present the body as if unmediated, so there's at least an unsurety in the phenomenological sense-making moment about whether the hologram is a virtual body or a real image. As digital display technologies increase in resolution and dimension, they produce more realistic and longer-lasting likenesses — Bentham dreamed of "likenesses more perfect than painting or sculpture could furnish"[27] — but the technology only furthers the project of the data body; it cannot (thus far) present a living, physical body. The auto-icon then, whether physical or digital, is a body for mixed realities, through which, as one Bentham scholar writes,

> the body's place in symbolic exchange endures. Because it at once resembles an icon and retains elements of the body itself, it is an uncanny hybrid of memorial and corpse. The body can never be entirely literal; insofar as it retains a hint of the corpse, it makes palpable the relationship between the living and dead, this world and another. As a result, Bentham's corpus resists an absolute literalization of the body, escapes the calculus of utility, and speaks of the ineradicable alterity of death.[28]

Bentham is having us on, but only a bit. Most texts about *Auto-Icon* refer to its humor, irreverence, its tongue firmly planted in cheek (the text is, as one highly cited Bentham scholar

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[26] Bentham, 13.
[27] Ibid., 5.
[28] David Collings, "Bentham's Auto-Icon: Utilitarianism and the Evisceration of the Common Body," *Prose Studies: History, Theory, Criticism* 23, no. 3 (2000): 96.

acknowledges, frequently "humorous,"[29] and Bentham himself admits his ideas would be ridiculed — *at first*). But the overall idea seems dear to the philosopher's heart, as he lingers on certain items from his list, namely in suggestions for staging animated dialogues between great figures of history, speaking with each other and answering queries from an audience. Bentham sketched out several programs starring Aristotle, Plato, and others (without acknowledging the significant challenge of exhuming such long-dead figures) and included a speculative script of lively, thoughtful banter between his own auto-icon and that of Francis Bacon. In this way especially, Bentham wanted to be preserved in posterity — and, given his philosophies about embodied identity and the negation of spirit,[30] the best remaining outlet for his immortality is on his actual posterior.

This dissertation has drawn an arc of the auto-icon's evolution from the kind of fixed material ontology Bentham valued into the more immaterial everyday realities of technically mediated existence. The hologram — as a vaporous iteration of auto-iconography and the latest herald of emergent technical imagery — affords its holosubjects with opportunities to see itself as a clear and present figure, an embodied communication practice projected into (and sometimes overlaying) existing realities. Because the holo-auto-icon seems spectral and immaterial, it performs additional work in renegotiating boundaries between presence and absence, life and death. Each experience of holopresence examined here serves to open spaces between epistemes in which holosubjects might experience and experiment with the spatial presence of abstractions, might encounter an image as subject rather than object, and thus might meet with ghosts on a level but liminal playing field. At the Polytechnic, John Henry Pepper

[29] C.F.A. Marmoy, "The 'Auto-Icon' of Jeremy Bentham at University College, London," *Medical History* 2, no. 2 (1958): 78.

[30] Bentham's auto-icon also is utterly true to the basic philosophy of utilitarianism for which Bentham is most known. Why dispose of a person's body when it can be repurposed to continue projecting the presence of the person and their persona?

harnessed the reflection of light to turn the human body into an image different from the photograph — one inscribed with Bentham's identity-over-similitude and seemingly liberated from surfaces by being projected at a distance from its material supports. London audiences watched this with uncanny fascination, and a century later — a few years after Adolfo Bioy Casares' novella, *The Invention of Morel*, provided a pivotal thought experiment about how the concept of the auto-icon might transition from anatomy to imagery — New Yorkers at the Museum of Holography were experiencing 3D light bodies throughout intimate galleries in which spectators moved their own bodies around and through the hologram bodies. Science-fiction transferred the spiritualist connotations of the optical hologram to the advances of digital computing, fusing photons with pixels and voxels and flirting with auto-iconic notions of digital bodies and archived-but-agential specters. In Chapter 3, I mentioned a *Star Trek* episode in which Lt. Data is seen enacting what is essentially Bentham's goal for the auto-icon, using the starship's imaginary holodeck to create holograms of Newton, Einstein, and Hawking for Data to converse with. (More than half of Pepper's only published volume of lectures consists of "Half Hours With the Alchemists," in which Pepper uses dramatic literary devices to revive the dead for new conversations, mainly in order to square their own epistemic contributions to his new science.[31] Pity he did not stage any of these with his ghost illusion.) And what is a new tour by Roy Orbison and Buddy Holly but an effort to auto-iconize long-dead pop icons made in the image of Saint Tupac?

Public and private proposals to develop ritual shrines to the dead featuring iconic holograms continue to fill contemporary discourse, from installing additional permanent performance spaces like the Illinois Holocaust Museum (or booking residencies in existing

[31] John Henry Pepper, *Popular Lectures for Young People* (London: Sampson Low & Son, 1855).

theaters, which has been cited as the best possible commercial model for hologram concerts[32] and is the format for Whitney Houston's pandemic-delayed hologram, rescheduled to open in October 2021) and even home systems. At the SXSW Interactive conference in 2015, a panel titled "HoloGramma: How Tech Can Bring Back Our Departed" was advertised with this blurb: "Grandma passed away last year, but she's coming back for Thanksgiving dinner this year. … If we can bring Tupac back to do a show w/ Dre and Snoop, then why can't we bring Grandma?" Four panelists discussed the technical capabilities and ethics of installing Pepper's Ghost holograms of deceased loved ones as living-room media, framed the idea as the natural evolution of the scifi imaginary (slides of Princess Leia's hologram from *Star Wars* were shown), and debated how such systems might "cheat death" and to what degree.[33] Bentham — who suggested that the living could keep private company with auto-icons in "an apartment destined exclusively for their own kindred"[34] — we hardly knew ye.

Cases of holopresence like these present arrangements of allegedly immaterial particles, such as photons and bits, not as matter nor as spirit but as a form suggestive of both. Vilém Flusser's technical image category, as I've been applying it throughout this research, encapsulates this liminal being, as well as the initially woozy experience of human spectators interacting with technically conjured and constructed phantoms.

Flusser described the technical image as "a form of art that results in images without material support (for instance, holograms),"[35] and this may be interpreted two ways.

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[32] Andy Greene and Kory Grow, "The Sudden, Lucrative Gold Rush for Old Music," *Rolling Stone*, June 8 2021.

[33] See the catalog text online (http://schedule.sxsw.com/2015/events/event_IAP37612) as well as a press release (http://www.webwire.com/ViewPressRel.asp?aId=196334). I was not present at this panel but have verified details of the panel discussion via personal communication March 6, 2018, with one of the panelists, David Deal, then-marketing director for AV Concepts.

[34] Bentham, 3.

[35] Vilém Flusser, *Immaterialism* (Metaflux, 2015), 7.

Literally, he means the images appear to be lifted from the surfaces of traditional imagery, and in the case of holograms may even seem freed from the frames of traditional screens. Holograms exacerbate this appearance by the veiling of their apparatus, from the Polytechnic to Coachella, projecting an image that appears independent of any imaging device. But figuratively, too, Flusser implies that encounters with these technical spirits — at least by this point in their historical emergence — also will lack *ideal* frames of reference and a singular phenomenal field for understanding and making meaning from their encounters (thus his labeling of postmodern experience broadly as *groundless*).

Digital video and holograms further this unmooring as they tow their virtualities into real spaces, everting virtual reality into real virtuality, seeming to "emigrate from their material support into the electromagnetic field" and become that "new photo"[36] (again, *a la* Casares' "new kind of photograph"[37]) — a subset and perhaps zenith of technical imagery that Flusser called, in a late-in-life essay published after his death, the *digital apparition*.[38] Such an apparition challenges modern experience by translating the ancient materialism of atoms into the postmodern experience of bits. For Flusser, the molecular level of reality is already a digital construct in the sense that he equates immaterial points with material ones, observing, "We are 'digital computations' of swirling point-potentialities."[39] Technical images are merely composed of "particles invading our molecular level," such as photons and pixels that may not achieve the status of matter but at least possess and animate stylized (not Platonically ideal) forms that exist in "a grey zone between matter and spirit" as hybrids: "materialised spirit and spiritualized

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[36] Vilém Flusser, "The Photograph as Post-Industrial Object: An Essay on the Ontological Standing of Photographs," *Leonardo* 19, no. 4 (1986): 331.
[37] Adolfo Bioy Casares, *The Invention of Morel (La Invencion De Morel)*, trans. Ruth L.C. Simms (New York: New York Review, 1964/2003), 74.
[38] Vilém Flusser, "Digital Apparition," in *Electronic Culture: Technology and Visual Representation*, ed. Timothy Druckrey (New York: Aperture, 1996).
[39] Ibid., 244.

matter."[40] Just as Professor Pepper worked to relocate matters of spiritualism from the séance room to the popular science theater, the emergence of technical imagery bestows at least some credence to those claiming its revolutionary impact (from aesthetic holographers to Flusser himself) through the radical reprogramming of spiritual concepts as products of media technologies. Indeed, per Flusser, "these crude simulations show that much of what philosophy (and theology) used to consider *spirit* … can be performed by apparatus," thus forcing the hailed holosubject to "have to think of everything concerning *spirit* all over again"[41] within the context of technical imagery. Holograms, then — be they optical, digital, or imaginary (or combinations of each) — mediate the ongoing co-existence of matter and spirit.

[40] Flusser, *Immaterialism*, 22, 11, 14.
[41] Ibid., 26.

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