Imagining the Posthuman:
Art, Technology, and Living in the Future

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Dedication

To Mom and Dad.

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"The Guide is definitive. Reality is frequently inaccurate." –The Hitchhiker's Guide to the Galaxy[1]

"The ultimate model of a cat is of course another cat, whether it be born of still another cat or synthesized in a laboratory." –Norbert Weiner[2]

Chapter 1: *Artificial:* An Introduction

Introduction

We are living in the future. I find myself consistently taken aback by this realization: startled at the things increasingly made possible by the technology that surrounds me, as well as the speed at which these developments occur. This is certainly due, at least partially, to the decade of my birth; born in 1980, I grew up in a household with both an electric typewriter and a Commodore 128. I learned to type on the latter, booting the PaperClip word processing program from a 5¼ inch floppy disk—but still took Typewriting my freshman year of high school, counting the letters in a given line in order to manually center them. My family first had the Internet at home that same year, keeping a hand-written record of our dialed-up online hours to avoid going over the 40 free offered by providers like America Online and CompuServe. I don't remember ever seeing my father express as much disappointment in me as he did when, having read the headline on the Prodigy home screen, I inadvertently gave away the victor of the tennis match he'd been taping off TV but had yet to watch. Talk about living in the future.

In October of 2012, I took a step further into this brave new world when I became the owner of the just-released iPhone 5, the fifth generation of a handheld technological marvel that has been revolutionizing social and technological interaction since 2007. In March of 2012, smartphones officially edged out dumb ones as the majority of U.S. cell

[1] Adams, Douglas, *The Ultimate Hitchhiker's Guide* (New York: Random House, Inc., 1986), 174.
[2] "Behavior, Purpose, and Teleology," in *Philosophy of Science*, Vol. 10, No. 1 (January 1943), 23 .

phone subscriptions—at the time just 50.4% of the market,[3] but as of February of 2013, already 53%.[4] The iPhone 5 was my own first smartphone, replacing a Samsung Rant whose primary claims to fame were a sliding qwerty keyboard; its survival of and recovery from a 20-foot plummet into a semi-frozen puddle; and the fact that at its retirement—still working, if a bit quirkily—it was, at nearly four years old, a veritable antique. The 5's claims to fame, on the other hand, are myriad and were highly praised at its release. *The New York Times*' technology columnist David Pogue, reviewing the phone before its general release, praises its "gleaming, black-on-black, glass-and-aluminum body" as "carr[ying] the design cues of a Stealth bomber," and its "startling" thinness. He mentions improvements to the impossibly high-definition Retina screen and calls the updated camera "among the best ever put into a phone." A feature introduced in the phone's predecessor, the 4s, returns: Siri, an Artificial Intelligence assistant, recognizes voice commands and performs tasks accordingly (though "thought recognition," as Pogue quips, "will have to wait for the iPhone 13").[5]

I had been wary of joining the ranks of smartphone users, who seem to share a disconcerting dependence on their devices, constantly consulting the miniature screens in their palms and getting twitchy when separated from them. As awkward as it is being the only person in a group *not* staring at a smartphone screen, I didn't relish the prospect of becoming one of them. Nonetheless, the sleek metal carapace and silky screen of my new device immediately entranced me, and I experienced more frequent "living in the future" moments as I explored its possibilities: depositing checks with a click of the camera

[3] Nielsen, "America's New Mobile Majority: A Look at Smartphone Owners in the U.S." http://www.nielsen.com/us/en/newswire/2012/who-owns-smartphones-in-the-us.html
[4] Nielsen, "How the Mobile Consumer Connects Around the Globe." http://www.nielsen.com/us/en/newswire/2013/how-the-mobile-consumer-connects-around-the-globe.html
[5] "The iPhone Scores Well, with a Quibble." *New York Times*, September 18, 2012.

button; video chatting with my sister and her infant daughter; live mapping a run, complete with pace and elevation data; "listening" to and identifying a song played over the speakers at a restaurant; being instructed, in real time, how to drive to a given destination.

This phone is eerily similar to a gadget presciently envisioned by one of the great future-imaginers, science fiction author and humorist Douglas Adams, to whom I now turn for a moment. Though known primarily for the rather wacky wit and creativity of his bestselling *Hitchhiker's Guide to the Galaxy* series, which endeared him to me when I discovered him as a high school sophomore, Adams was in fact "deeply read in science"—according to none other than evolutionary biologist and best-selling author Richard Dawkins. Dawkins, who became friends with Adams after writing the latter a fan letter and learning the admiration was mutual, described Adams' "sophisticated humor" as "founded in a deep, amalgamated knowledge of literature and science."[6] It is perhaps not surprising, then, especially given his equally well-known love of Macintosh computers, just how prescient his eponymous Hitchhiker's Guide proved to be. Looking "rather like a largish electronic calculator," with a small screen and lots of tiny buttons, the Guide is what one of its contributors, Ford Prefect, describes as "a sort of electronic book [that] tells you everything you need to know about anything."[7] Though it holds "several inconveniently large buildings"' [8] worth of information on, as might be assumed, the entire galaxy, earthling protagonist Arthur Dent is dismayed, however, to learn that the entry on his beloved home planet comprises just two words: "Mostly harmless."[9]

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[6] "Epilogue," *The Salmon of Doubt* (New York; Random House, Inc., 2002), 290.
[7] Ibid, 37.
[8] Adams, *Hitchhiker's Guide*, 20.
[9] Ibid, 44.

Indeed, throughout the series, Adams displays little reverence for the "utterly insignificant little blue-green planet whose ape-descended life forms are so amazingly primitive that they still think digital watches are a pretty neat idea."[10]

Adams was, however, certainly impressed by the technology he saw emerging in the 1980s, and was an early devotee of Apple products, named one of their "AppleMaster" celebrity ambassadors. His fondness for his Macs, as well as his awareness of living in the future, is captured in a 1989 essay for *MacUser,* in which he writes, "I adore my Macintosh, or rather my family of however many Macintoshes that I've recklessly accumulated over the years. I've adored it since I first saw one at [software company] Infocom's offices in Boston in 1983."[11] Just six years later, he finds himself moving between multiple machines, one of them "my portable Mac (I know, I know, you hate me. Listen. We'll all have one in the end. They'll bring the price down, trust me.)."[12] Living in the future means that even as technology changes rapidly, the price and size continue to drop. This is evident in today's machines that function so like Adams' imagined Guide. In the conclusion to his 2010 *Time* magazine cover story praising the newly-released iPad, Adams' longtime friend, British actor and comedian Stephen Fry, wrote, "One melancholy thought occurs as my fingers glide and flow over the surface of this astonishing object: Douglas Adams is not alive to see the closest thing to his *Hitchhiker's Guide* that humankind has yet devised."[13] It was science fiction in 1979; a

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[10] Ibid, 5.
[11] "Frank the Vandal," in *The Salmon of Doubt: Hitchhiking the Galaxy One Last Time* (New York: Random House, Inc., 2002), 90.
[12] Ibid, 89.
[13] "The iPad Launch: Can Steve Jobs Do It Again?" *Time*, Vol. 175, No. 14, April 12, 2010. Online at http://www.time.com/time/magazine/article/0,9171,1977113-1,00.html.

faint possibility when I first encountered the book 15 years later; and reality merely 15 years after that.

Adams died unexpectedly in 2001, very shortly after a lecture he gave at the University of Santa Barbara entitled "Parrots, the Universe, and Everything"—a lecture not surprisingly, given our residence in the future, available to view online.[14] In it, Adams discusses what he calls his favorite of the books he's written, *Last Chance to See*, a collaborative effort with zoologist Mark Carwardine.[15] In his lecture, he describes several of the rare and endangered species the two studied: the Madagascan aye-aye lemur; the Komodo dragon; the flightless New Zealand kakapo parrot; and the nearly-blind baiji, or Yangtze River dolphin. The latter two represent particularly interesting cases of animals that have evolved to fit a particular environment and are incapable of surviving when that environment changes rapidly. In the case of the former, parrots in a protected, predator-free environment, had become fat and lost the ability to fly—resulting in their near-eradication when Europeans, with their attendant dogs, cats, stoats and rats, arrived on their formerly secluded island. In the latter, dolphins in the impenetrably turbid Yangtze evolved a highly sensitive sonar ability to compensate for their near-complete lack of sight, which served them well until the advent of motorized vessels introduced pervasive sound pollution that resulted in the essentially blind and now-deafened dolphins' extinction. The Kakapo's extraordinarily complex and drawn-out reproductive process, the perfect solution to maintaining a stable population in the absence of predators, "seems like absurd behavior to us," Adams says, "but it's only because its environment has

[14] From the "Voices" series, #5779. Posted May 28, 2001. Online at http://www.uctv.tv/shows/Douglas-Adams-Parrots-the-Universe-and-Everything-5779.
[15] (New York: Random House, Inc., 1992).

changed in one particular and dramatic way that is completely invisible to us"—leaving the kakapo "completely out of tune with the environment it now finds itself in."[16]

In the lecture, Adams turns from these discussions of out-of-tune animals to a species in a changing environment that he doesn't discuss in the book: humans. A 1992 interview with journalist Steve Homer in the *Independent*, however, reveals that although the book doesn't make it explicit, the concept has long been on Adams' mind: "There are very nice, neat parallels you can make," Adams says, "between the way in which the kakapo perceives its world—the nature of the world it lives in, how it comes to perceive it in that way, and how it comes to behave in the way it does in relation to the world that it thinks it sees—and us."[17] Like the kakapo, humans find themselves in a changed world: this one characterized by an increasing ability to collect and use information, Adams says, and, more recently, to use the computer to "start putting things together to see how they work… to see actual processes at work, and… begin to see how very very simple things lead inexorably—by iteration after iteration—to enormously complex processes emerging and blossoming."[18] For Adams, this visualization of the process of the emergence of life is deeply compelling—and significantly decentering of the human, who, despite knowing more about life and the world than ever before, is increasingly bringing about its destruction. Humans are in danger of being caught, kakapo-like, in a mindset that evolved under different environmental conditions and is no longer tenable. Adams illustrates this with the metaphor of a puddle "waking up" and considering that, given how *perfectly* he

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[16] Adams, "Parrots," n.p.
[17] "Mankind as Sickly as a Parrot: Douglas Adams Leaves His Apple Macs to tell Steve Homer how Technology can Rescue a Human Race That is Stranded Like a Flightless Bird." October 5, 1992. The article was published on the release date of the fifth book in Adams' *Hitchhiker's Guide* series, entitled *Mostly Harmless*. http://www.independent.co.uk/news/science/mankind-as-sickly-as-a-parrot-douglas-adams-leaves-his-apple-macs-to-tell-steve-homer-how-technology-can-rescue-a-human-race-that-is-stranded-like-a-flightless-bird-1555585.html.
[18] Adams, "Parrots," n.p.

fits the indentation in which he finds himself, it could only have been designed specifically for him—a thought he maintains right up until he evaporates into oblivion. "[I]f we think that the world is here for us," Adams concludes, "we will continue to destroy it in the way that we've been destroying it, because we think we can do no harm." It is from this space of awareness—that human beings are not at the center of the universe, masters of their own domain—that posthumanism, and the posthuman, the subjects of my study in this project, emerge.

I began this chapter with a claim to which I've repeatedly returned: "We are living in the future." Our everyday lives, that is, are increasingly mediated by technologies so new, so relentless in their onslaught, and so different from what was the norm only a few years ago, that we are more keenly aware than ever of the gap between how they so recently were and how they now are. To live in the future is to experience the doubling gesture of projecting oneself backward in time (recognizing today's present as that past's future) while understanding the future as an onrushing force shaping the present even as it leaves it behind—the post-present. It is precisely in this sense that I posit the "post" of the posthuman. My "post-" doesn't delineate a firm boundary or radical *after*. This posthuman doesn't emerge to wipe out and replace the human as we know it. Rather, it both adapts to and shapes the future-present: a corrective to the limits of the liberal humanist subject and borne on waves of futuristic technological development, including cybernetics, robotics, Artificial Intelligence, and the Internet.

As an art historian, I am concerned, naturally with vision and representation. As one living in the future, I'm also concerned with their *un*natural aspects: the way technology presents certain things to sight; the conclusions offered by particular kinds of "seeing";

the idea of the real in an age of hyperreality; the meaning of the body when it's seen as machine. This project represents my attempt to understand, through the lens of contemporary art, what it means to live in the future—and where the future goes from here. It is a question I've approached specifically through the concept of posthuman*ism*—an orientation to the world that thinks beyond the centrality of the liberal humanist subject. Against this liberal humanist subject, I posit the figure of the posthuman: a product, symbol, and mindset of posthumanist future-living. Like Donna Haraway's iconic cyborg, the posthuman is an imagined, rhetorical figure that navigates the contemporary techno-social milieu, reflecting both the dreams and fears of the contemporary and coming age.

Although these posthuman themes have been identified and analyzed in literature, perhaps most notably by literary critic N. Katherine Hayles in *How We Became Posthuman*, (1999), art historians have been slow to explore visual representations and imaginings of the posthuman in contemporary art. Whether the figure of the posthuman suggests boundless potential or entrapment in a tight web of capital and its attendant tools of regularization and surveillance; technologies for augmenting and extending the body, or abandoning it altogether; I argue that it bears thinking about what it might *look* like, and the role the visual plays in conceiving the posthuman. The lens of posthumanism offers the opportunity to think about how contemporary art—particularly through ideas of the body and its relationship to technology—shapes and is shaped by a world in which a rational humanist subject no longer reigns supreme, but is increasingly open to the opportunities and perils of intermixture with multiple organic and digital entities.

In the chapters that follow, I address works of art that I argue embrace a complex posthuman perspective, and that imagine, from different angles, the posthuman figure. These projects neither celebrate the posthuman as triumphalist, technologically-enhanced superhuman, nor fear it as representing the impending destruction of the embodied, feeling human. They are much more nuanced, particularly because while the respective artists' rhetoric may at times veer toward the hyperbolic, it is countered (arguably calculatedly) by the "failure" of the technology and bodies involved to support it. I read these projects as displaying a particular intimacy between bodies and technology unique to the posthuman milieu: a decentering of an exultant liberal humanist subject in favor of a networked, interdependent, contingent being. Existing as they do outside the realm of the pristine laboratory or the science fiction plot, these artworks represent—perhaps ironically, given their inherent "artifice"—the "real."[19] I've chosen them because of the questions they allow me to ask about what it means to live, see, and be embodied in the future: What happens when sci-fi ideas, futuristic technology, and living bodies collide? What does it mean to be posthuman, and what does that figure look like? What is the role of the body from a posthumanist perspective? Is there a particularly posthuman way of seeing? What does living in the future mean for our relationships with each other and our non-human organic others? What are the benefits, or dangers, of embracing a posthumanist perspective?

In the first chapter following this one, *Skin*, I focus on the French performance artist Orlan's 1990-1993 series *The Reincarnation of Saint Orlan*, in which she uses plastic

[19] In author David' Shield's 2010 *Reality Hunger: A Manifesto*, he argues that the best of contemporary art (in his focus, primarily literature) comes from the intertwining and intermingling between, and indiscernability of, so-called fact and fiction. "*Reality*, as Nabokov never got tired of reminding us," Shields writes, "is the one word that is meaningless without quotation marks." (New York: Alfred A. Knopf), 3-4.

surgery to open and rework her skin, and Oron Catts and Ionat Zurr's 2004 *Victimless Leather: A Prototype of Stitch-less Jacket Grown in a Technoscientific Body,* a "semi-living sculpture" grown in a bioreactor. I examine the idea of skin as a metaphor for a bounded, rational humanist subject, and how these two projects interrogate that notion. I read Orlan as a cyborg in the mold of Donna Haraway's "Cyborg Manifesto," and argue that her gesture of opening the skin, making of it an indeterminate, unfixed, porous border, is a patently posthuman one. *Victimless Leather*, like Orlan herself, represents an amalgamation of multiple organisms and technology, revealing the sort of "impure mingling" that allows us to see the posthuman environment.

In Chapter 3, *Immersion*, I address Canadian artist Char Davies' Virtual Reality (VR) projects—or, as she prefers, "immersive virtual environments"— *Osmose* and *Ephémère*. Although these projects were developed with cutting-edge technology, I argue that they are undergirded by a persistent binarism that makes them seem much more old-fashioned than simply their vintage technology. I contrast the experience they offer of the virtual—drawing clear divisions between male/female, self/other, body/machine, real/virtual with today's porous experience of the digital environment—an experience I maintain is closer to the science fiction imaginings of virtual space that I discuss early in the chapter than it is to the structured, encapsulating one offered by Davies' projects.

In the final chapter, I attempt to bridge two apparently competing definitions of posthumanism, one offered by Hayles and one by Cary Wolfe, through the work of Australian performance artist Stelarc. I attempt a synthesis of what Wolfe calls the transhumanism inherent in Hayles' posthuman and the systems theory that defines his, arriving at the rather tongue-in-cheek label of posttranshumanism to capture the transhumanist tendencies in Stelarc's rhetoric and the posthumanist ones visible in his performances. Stelarc offers a model for living in the future that moves as easily between Hayles' science-fiction analysis and Wolfe's complex theoretical webs—a truly agile "new barbarian" of the posthuman imagined by Michael Hardt and Antonio Negri.

Before I move on to these individual case studies, however, I wish to focus on the historical emergence of the posthuman, reviewing the literature and addressing the social, scientific, and cognitive foundations of this shift in thinking. I am aware that the term posthuman may at first evoke negative reactions; aren't we all, after all, still just humans? Indeed, cultural theorist Neil Badmington, in the introduction to his *Posthumanism* (2000), selects as his epigram the following exchange from the film *Don't Look Back*:[20]

> *Bob Dylan*: We're different. We come from two different worlds. You come from England; I come from the United States.
> *Interviewer*: That's true, that's true, but we're still human beings, so there's some sort of connection between us.
> *Bob Dylan*: No, I'm just a guitar player, that's all.[21]

We're still human beings. Certainly we (still—nearly 50 years later) are, though as the oft-abstruse folk philosopher[22] suggests, that has never meant being the same—or even being able to relate to one another. What hope can remain for us then, if, as the "post-" seems to suggest, we have actually entered an era that leaves behind even that tenuous connection of humanity? I wish to emphasize that I see the posthuman perspective as an emphatically positive and uniting one, with the potential to form much stronger connections than simple recourse to "we're still human beings." It by no means denies

[20] Don Alan Pennebaker, Director (Docurama: 1967).
[21] Badmington, ed. (Houndsmills: Palgrave, 2000), v.
[22] A favorite of mine since I discovered his stance on hair: "But I guess if you figure it out, you realize that all of one's hair surrounds and lays on the brain inside your head. Mathematically speaking, the more of it you can get out of your head, the better. People who want free minds sometimes overlook the fact that you have to have an uncluttered brain. Obviously, if you get your hair on the outside of your head, your brain will be a little more freer." Nat Hentoff, *Playboy* Interview, "Bob Dylan: a candid conversation with the iconoclastic idol of the folk-rock set" (Chicago, 1966), 139.

the experience of being an embodied human (an embodiment experienced distinctly differently by each of us, anyway), but widens our awareness that our seemingly "different worlds" are in fact richer, and more connected, than we ever before realized.

Following my brief overview of this literature, I conclude this chapter with a discussion of Christa Sommerer and Laurent Mignonneau's 2006 interactive artwork *Life Writer*, an elegantly simple and intuitive project in which letters produced by typing on a vintage Royal typewriter transform into "creatures" that interact with the user and each other based on their unique "genetic" code. *Life Writer* combines technologies separated by nearly a century into a single, playful, evocative object[23] that is as powerful for what it doesn't show as what it does. As a fundamentally hybrid project, *Life Writer* is also a useful model for this chapter itself, which finds itself frequently trying to weave together disparate histories of technology and thought, pursuing the figure of the posthuman not through the intimate body-machine interfaces to which I will turn in subsequent chapters, but through the history that grounds and makes possible such interfaces. *Life Writer* allows me to outline the history of ideas and technology that forms, largely through the figure of the cyborg, the basis for thinking the posthuman. I use this piece as an entry point into the world of Artificial Life (AL), tracing its history through the work of Sommerer and Mignonneau's earlier collaborator, biologist Thomas Ray, and as far back as the mathematicians and scientists who, around the end of the second World War, were attempting to make sense of the meaning of life through digital models. I examine the implications of understanding human life in terms of these computer models, particularly as our technological abilities and communications networks increase. I conclude by

[23] I borrow this phrase from psychologist and philosopher of technology Sherry Turkle, who edited a collection of essays by the same title, *Evocative Objects: Things We Think With* (Cambridge, Mass.: The MIT Press, 2007).

considering one projected outcome of this increase, a scenario called the Singularity, in which exponentially-growing machine intelligence finally outstrips human intelligence. This chapter, like the piece at its center, is a hybrid, as I strive to introduce to the idea of the posthuman, review the science and philosophy that ground its imagining, and highlight the role of art history in understanding it. I weave these stories to ground the case studies that form the following three chapters.

The Emergence of the Posthuman: Reviewing the Literature

In 1977, literary theorist Ihab Hassan noted the beginning of "a potential in our culture… a tendency struggling to become more than a trend."[24] In facing this change, he noted, "We need to understand that five hundred years of humanism may be coming to an end, as humanism transforms itself into something that we must helplessly call posthumanism."[25] As "helpless" as he may have felt in assigning that term, and as wary as he is to suggest what "may appear variously as a dubious neologism, the latest slogan, or simply another image of man's recurrent self-hate,"[26] Hassan understood the label as a useful framework for understanding the decentering of the liberal humanist subject. This subject may be understood as fully self-determined, rational, possessed of a fixed and coherent identity and—as paradigmatically a white, European male—superior to all "others." As early as 1916, Sigmund Freud was identifying cracks in that liberal humanist edifice: the Copernican revelation that the earth was not the center of the universe; the Darwinian theory of evolution and hence humans' small distance from other animals; and

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[24] Quoted in Neil Badmington, "Introduction: Approaching Posthumanism" in *Posthumanism*, Neil Badmington, Ed. (New York: Palgrave, 2000), p. 2.
[25] Ibid.
[26] Ibid.

his, Freud's, pronouncement that man is not even the master of his own mind.[27] To Freud's three "major blows at the hands of science" to "the *naïve* self-love of men," [28] feminist scientist, philosopher, and historian Donna Haraway, one of the strongest opponents of understanding the world in terms of rigid binaries and repressive boundaries, adds a fourth. She calls this fourth wound "the informatic or cyborgian, which infolds organic and technological flesh and so melds that Great Divide as well."[29] Not only, that is, is the human not at the center of the universe, not the result of a "privileged place in creation," and the ego "not even master in its own house," but finds itself enmeshed in and defined by technology it may not even understand.

In what remains perhaps her best-known work, the essay "the Cyborg Manifesto," Haraway employs the cyborg, an amalgamation of organism and machine, as a metaphor for exploring agency in an ever-more wired and networked world. Because the cyborg is the product of an impure mingling of organism and machine, without a natural origin story and untraceable to a mythical Garden of Eden, it represents "transgressed boundaries, potent fusions, and dangerous possibilities."[30] Instead of cowering in the face of the "informatics of domination," which Haraway sees as usurping "the comfortable old hierarchical dominations,"[31] and which represent the webs of power present in an increasingly technologically-mediated social reality, the cyborg, illegitimate and resistant hybrid, has the power to navigate. "Cyborg imagery," Haraway writes, "can suggest a

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[27] Freud, "Fixation to Traumas—The Unconscious," *Introductory Lectures on Psychoanalysis*, ed. James Strachey and Angela Richards, trans. James Strachey, Pelican Freud Library, vol. 1 (1916-17) (Harmondsworth, 1973), 236, quotes in Neil Bandmington, ed., *Posthumanism* (Houndsmills: Paglrave, 2000), 6.
[28] Ibid.
[29] Donna Haraway, *When Species Meet* (Minneapolis: University of Minnesota Press, 2008), p. 11.
[30] Haraway, "A Cyborg Manifesto," in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), p. 154.
[31] Ibid, p. 161

way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves."[32] The cyborg, as not merely human *or* machine, organic *or* technological, presents ways of thinking inbetweenness.

Haraway's cyborg, intimately connected to technology and an "illegitimate [fusion] of animal and machine,"[33] bears a strong resemblance to what Hayles calls the posthuman in *How We Became Posthuman*. Hayles defines the posthuman as "an amalgam, a collection of heterogeneous components, a material-informational entity whose boundaries undergo continuous construction and reconstruction."[34] Haraway describes the cyborg as variously "a fiction mapping our social and bodily reality,"[35] "an imaginative resource suggesting some very fruitful couplings,"[36] "ether, quintessence"[37] and a "floating [signifier]."[38] It is, then, a discursive figure, but with real-world implications. Hayles, alternatively, frames the posthuman as "a point of view," but insists that although this outlook tends to privilege information over substance, to view the body as merely a prosthesis for the mind, and to imagine the human as "configure[d]... so that it can be seamlessly articulated with intelligent machines,"[39] subjects in a real posthuman future must necessarily remain embodied. For Hayles, the idea that thought can be separated from the body that houses it is patently ridiculous, involving a series of logical gaps and forgettings in the story of scientific and technological development that allow for the imagination of disembodiment that she sees as impossible and absurd. Her project,

[32] Ibid, p. 181.
[33] Ibid, p. 176.
[34] N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press), p. 3.
[35] Haraway, *Simians,* p. 150.
[36] Ibid.
[37] Ibid, p. 153.
[38] Ibid.
[39] Hayles, p. 3.

however, is not a rehabilitation of the liberal humanist subject, which she sees as "deeply entwined with projects of domination and oppression."[40] Instead, she argues that embodiment is a necessary and productive aspect of a posthuman future, and writes that

> If my nightmare is a culture inhabited by posthumans who regard their bodies as fashion accessories rather than the ground of being, my dream is a version of the posthuman that embraces the possibilities of information technologies without being seduced by fantasies of unlimited power and disembodied immortality, that recognizes and celebrates finitude as a condition of human being, and that understands human life is embedded in a material world of great complexity, one on which we depend for our continued survival.[41]

A professor of literature as well as a scientist, Hayles draws examples of posthuman figures from (primarily science-fiction) literature, reading them in an attempt both to point out the ways in which disembodied figures are abstracted textual productions at odds with the embodied materiality that comprises the real world, and to compare them to scientific theories.[42] Something very like her "dream" posthuman is to be found in the works I analyze in this project, although hiding, at times, behind rhetoric that does proclaim the obsolescence of the body.

It is predictable that in an area of study entitled "posthumanism," the focus would be on the new, and such is often the case. If an attempt at a lineage is made, it is often perfunctory, briefly addressing a Cartesian dualism and Enlightenment automata as predecessors of the cyborg. However, two important books, both published in 2007, insist upon the importance of understanding that ideas of posthumanism and the cyborg do not spring fully formed from contemporary thinking and technology, but emerge from a long tradition of understanding the human mind and body through the metaphors of

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[40] Ibid, p. 5.
[41] Ibid.
[42] Ibid, pp. 22-23.

contemporary technology. *Genesis Redux* is a collection of essays that trace what editor Jessica Riskin calls "the Sistine gap,"[43] that mysterious space between the body as machine and the self, a problem that long preceded, though it did inform, Descartes' understanding as the body as "an earthen machine"[44] animated by a "*rational* soul."[45] As technology and scientific knowledge have increased in subsequent centuries, developments in genetics, microbiology, and digital culture have, rather than resolving these questions, further complicated them. In *The Enlightenment Cyborg*, author Allison Muri articulately refutes the idea that the cyborg is entirely a post-World War II invention, as well as that a simple Cartesian mind-body dualism sufficiently explains Enlightenment thought so often linked to cyborg imaginings. Instead, Muri examines the complex ways in which Early Modern thinkers conceived of the human body, often using developing technology (especially of communication) as a metaphor, and exploring whether, or how, an immortal soul existed, through anatomical and philosophical treatises. Although a cyborg proper could not have been imagined in the Enlightenment, then, the thinking that would lead to them, post-WWII, had its origins in a more complex Enlightenment thought than is often understood.

It was in the wake of the second World War that scientific discovery and technological advances, combined with the trends in thought mentioned above that achieved particular salience during the Enlightenment, precipitated the creation of the cyborg, the hybrid product of machine and organism that would inspire Haraway's

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[43] *Genesis Redux: Essays in the History and Philosophy of Artificial Life* (Chicago: University of Chicago Press, 2007). On the book's cover, the frescoed fingers of Michelangelo's God and Adam stretch perpetually toward one another, never touching to bridge the gap.

[44] *Traité de l'homme*, written 1629-1633, published in 1664; quoted in Allison Muri, *The Enlightenment Cyborg: A History of Communications and Control in the Human Machine, 1660-1830*, (Toronto: University of Toronto Press, 2007), p. 54.

[45] Ibid, p. 110.

powerful metaphor and the idea of the posthuman. A crucial development in the 20th century was the idea of the gene. As historian and philosopher of science Evelyn Fox Keller explains in *The Century of the Gene*, the concept that the gene was a code that acted as a unit of hereditary transmission as well as the blueprint for each individual exerted a powerful lure that shaped thinking about the body and its potential legibility.[46] It was physicist Erwin Schrödinger who in 1945 first proposed the idea of a "code-script" in the chromosomes that could act as both "law code and executive power—or to use another simile,… architect's plan and builder's craft in one."[47] The idea of gene as code remains potent, Keller describes, even as scientists who completed the project of mapping the human genome in 2003 are still largely baffled about how the gene (which is more effective as an idea than a material entity) works. Keller stresses that human life is not reducible to a code, but that embodiment is not only a result of the gene, but a very necessary prerequisite for the gene's own creation and functioning.

Richard Doyle, a professor of English, and formerly Keller's student and advisee, makes a similar argument in *On Beyond Living* (1997), introducing the idea of "rhetorical software" to describe the framework in language that makes imagining certain concepts possible through a necessary erasure of other important factors. For example, Schrödinger's imagined code-script is supposed to contain the plans for the organism through all the stages of its development—but that conclusion is drawn retroactively from the fact of the mature organism's body. It is this rhetorical software, Doyle, argues, that allows certain ideas to be conceived at all, and sets the stage for imagining things such as

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[46] (Cambridge: Harvard University Press, 2000).
[47] Erwin Schrödinger, *What is Life? The Physical Aspect of the Living Cell* (Cambridge: The University Press, 1945), p. 23.

life independent of embodiment, and programs run on a computer as "life." The idea of rhetorical software will form an important aspect of my analysis of *Life Writer*.

In addition to scientific discoveries and theories that cast the body as the legible product of a written code, the cyborg and posthuman become possible in what Charlie Gere calls "digital culture." In his 2002 book *Digital Culture*, Gere's thesis is that "digital technology is a product of digital culture, rather than vice versa"; that certain ways of thinking and cultural forces precede the technologies that actualize them. Technological developments in the last century have been the product of the thinking demanded by capitalism—in particular, increasing trends toward abstraction, communication, miniaturization and representation—and are particularly indebted to the funding and militarization of WWII. These technologies, which experienced another boom with the Cold War, have come to form the basis of a culture that provides a new metaphor for thinking about the mind and body: the computer and software. Claude Shannon's Information Theory, developed in the 1940s, was important for these developments as it allowed for the conceptualization of the "message" as separate and distinct from either its content or its delivery system.

Information Theory also influenced the field of Cybernetics, the name of which was coined by its major proponent, MIT mathematician Norbert Wiener, based on "the Greek word *κυβερναν* meaning to govern, as essentially the art of the steersman,"[48] and which Gere identified as "a general theory of…'control and communication in the animal and machine' with particular concern for issues of feedback and self-regulation."[49] In 1960, Manfred Clynes and Nathan Kline introduced the term "cyborg," a shortening of

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[48] Norbert Wiener, "Men, Machines, and the World About," in *The New Media* Reader (Cambridge: The MIT Press, 2003), p. 69.
[49] Charlie Gere, *Digital Culture* (London: Reaktion Books, 2002), p. 50.

"cybernetic organism," to explore the possibility of a self-regulating union of organism and machine that would allow for survival in space. *The Cyborg Handbook* (1995) edited by Chris Hables Gray, Heidi J. Figueroa-Sarriera and Steven Mentor, an impressive tome collecting half a century of cyborg research, theory, and imaginings, contains this story and a picture of the first cyborg: a lab rat fitted with an automatic pump to administer medicine based on feedback mechanisms (fig. 1).[50] Needless to say, since then the cyborg has become a pervasive force in theory, as well as a formidable presence in reality, especially if one is to count as a cyborg all organisms modified with technology, as some do, from individuals with pacemakers to those who have received immunizations.

Views of whether the cyborg and the posthuman and the digital culture they occupy are a positive or a negative thing have been mixed. At one end of the spectrum is Donna Haraway, who sees an increasingly technologized world as an opportunity for individuals—especially ones, such as women and minorities, who have traditionally been repressed by "hierarchical dominations"[51]—to exert agency and freedom of movement in a world relieved of oppressive boundaries that have for too long naturalized dominance. At the other end of the spectrum is the French philosopher Jean Baudrillard, who sees technology as facilitating the replacement of the real with its simulacra, and repressively isolating and alienating individuals. Baudrillard argues in "Prophylaxis and Virulence" that in an increasingly digital world of sped-up networks of communication, humans, "conceived of as digital machines," as well as thought itself, are at risk in a world

[50] (New York: Routledge).
[51] Haraway, *Simians,* p. 161.

increasingly sterilized by technology, where viruses may be the system's reaction to protect itself from the greater threat of overabundance of communication.[52]

Michael Hardt and Antonio Negri also see the world as increasingly networked, in interlocking webs of global capital that they call Empire. For them, the posthuman represents a figure that, although still bound to operate within the rules of the system of Empire, can exercise agency and movement, both navigating and resisting this overarching world order. This resistance requires a remaking of the self, a "creative evolution"[53] that resists biopolitcal controls on the ability to produce in order to circulate. Thus, like Haraway's cyborg, the posthuman renders indistinct and consequently denaturalizes the assumed boundaries "between the human and the animal, the human and the machine, the male and the female, and so forth; it is the recognition that nature itself is an artificial terrain open to ever new mutations, mixtures, and hybridizations."[54] To some extent, this transformation can be revealed physically, such as by dressing in drag, and Hardt and Negri write that

> [w]e do certainly need to change our bodies and ourselves, and in perhaps a much more radical way than the cyberpunk authors imagine. In our contemporary world, the now common aesthetic mutations of the body, such as piercings and tattoos, punk fashion and its various imitations, are all initial indications of this corporeal transformation, but in the end they do not hold a candle to the kind of radical mutation needed here.[55]

This physical description of posthuman possibilities is uncommon for the theoretical discourse, and, as Hardt and Negri emphasize, only begins to hint at the transformations required in becoming posthuman. Although these themes have been analyzed in

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[52] Jean Baudrillard, "Prophylaxis and Virulence," in Badmington, p. 37.
[53] *Empire* (Cambridge: Harvard University Press, 2000), p. 216.
[54] Ibid, p. 215.
[55] Ibid, p. 216.

literature, especially the cyberpunk and science fiction Hardt and Negri reference here, far less attention has been paid to imagery.

In fact, the question of what the posthuman might look like, or what visual characteristics might reveal the ideas of blurred boundaries, impurity, agency, or intimacy with digital technology that tend to characterize it, has been little examined, particularly by art historians. Amelia Jones' book *Self/Image*, of 2006, provides one way of thinking about these concerns, emphasizing the "*never enough*" of photography and digital media in capturing the essence of the self.[56] In addition, it discusses subjects and bodies that might, though she only uses the term once, be considered posthuman: whether a resistant faction reclaiming and revealing their inhabited, postmodern, urban environment, such as the artists' group Asco; women performing bodily transformations before a camera or on video, such as Renée Cox or Pipilotti Rist; or an artist using visible technology to augment the body, such as Stelarc. This book is a more revealing and in-depth study than collections like *Posthuman Bodies* (1995), edited by Judith Halberstam and Ira Livingston,[57] or *Virtual Futures* (1998), edited by Joan Broadhurst Dixon and Eric J. Cassidy,[58] both of which seem enthralled primarily by sexual difference and provide little, if any, visual analysis. *The Prosthetic Impulse: From a Posthuman Present to a Biocultural Future* (2006), another collection of essays, edited by Marquard Smith and Joanne Morra, does provide more visual exploration of posthuman possibilities, particularly through pursuing the concept of the prosthetic, which ranges in focus through the volume from physical limbs to extensions of memory or thought.[59]

[56] *Self/Image: Technology, Representation and the Contemporary Subject* (New York: Routledge).
[57] (Bloomington: Indiana University Press).
[58] *Virtual Futures: Cyberotics, Technology and Post-Human Pragmatism.* (New York: Routledge).
[59] (Cambridge, Mass.: MIT Press).

Although the visual has been little studied in understanding the posthuman and the possibilities it represents, artists have been engaging with posthuman themes of boundary-crossing and productive intermixture, as well as explorations of the current digital culture and webs of capitalist control, for decades. Certain kinds of art, by their very indefinability and refusal to be productized, highlight the resistant possibilities of visual expression. Performance art is a particularly potent example of this, as performance historian Peggy Phelan describes in "The Ontology of Performance." Phelan writes that since performance is necessarily ephemeral, existing only in the present, it refuses easy cooption into a capitalist cycle of exchange value. "Performance's independence from mass reproduction," she writes, "technologically, economically, linguistically, is its greatest strength."[60] Beyond that, performance is a play between presence and absence: it depends explicitly on the body of the performer, while that body, for all its availability, disappears as it becomes art.[61] It is a form of language that cannot be captured in writing. It leaves no trace or triumphant product of a mythical Author/father figure—a figure which, theorist Roland Barthes argued in his seminal 1967 essay, is dead. This Author's heroic product, the "work," is replaced by the "text," which is now open to a multiplicity of readers.[62] The work of art is no longer restricted to a material object, but actually occurs within individual viewers/participants. One early piece to explore this theme was John Cage's 1951 *4'33"*, which, though it appears to consist of silence, in fact encompasses the intentional and unintentional sounds of the audience itself. Alan Kaprow's *18 Happenings in 6 Parts* (1959) (fig. 2) is another, more overt example, of a work that blurs the distinction between performer and audience, by

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[60] In *Unmarked: The Politics of Performance*. (New York: Routledge, 1993), 149.
[61] Ibid, 150.
[62] "Death of the Author," in *Image, Music, Text* (New York: Hill and Wang, 1977).

actually assigning viewers parts in the performance. Digital media also allow for the creation of works that leave no material trace, but are seemingly given existence only through the arrangement of pixels on a screen, such as Simon Biggs' online, interactive *The Great Wall of China* (1999) (fig. 3). Finally, if the physical body had also been seen as a discrete and bounded entity, art challenged this as well, from French artist Orlan's opening and transformation of her body via surgery in her series *La Reincarnation de Sainte-Orlan* (1990-1993) to Eduardo Kac's genetic modification of the rabbit Alba, the glow-in-the-dark *GFP Bunny* (2000) (fig. 4).

Life Writer

I turn now to another work that relinquishes authorship, quite literally, to its audience: Christa Sommerer and Laurent Mignonneau's 2006 *Life Writer* (fig. 5). *Life Writer*'s connection to the body is not as immediately visible as it is in the other works I address, such as projects by Orlan, Stelarc, or even Char Davies. What is on display in *Life Writer* is not an intimate interface between flesh and machine, but an even deeper correspondence: it posits life itself as an encoded, machinic, phenomenon. This is not an idea unique to *Life Writer*: the idea of the mystery of life as somehow scripted goes at least as far back as Schrödinger's "code-script" metaphor, and persists in popular understanding of the gene.[63] What *Life Writer* highlights is the invisible. In a classic scene in the 1987 film *The Princess Bride*,[64] the hero, Westley, presents his nemesis Vizzini with a tiny vial, which the latter sniffs and hands back, saying, "I smell nothing." "What you do not smell," returns Westley, "is called Iocaine powder. It is odorless, tasteless, dissolves instantly in liquid, and is among the more deadly poisons known to

[63] See Keller for an in-depth discussion of this phenomenon.
[64] Rob Reiner, Director. Twentieth Century Fox Film Corporation.

man." (Later, the villainous Prince Humperdink, examining the abandoned scene and the now-dead Vizzini, sniffs the same vial and pompously declares, "Iocaine. I bet my life on it.") The very essence of this substance is what is *doesn't* reveal. *What we do not see*, in *Life Writer*, is the actual code—the DNA, as its artists call it—that programs the creatures brought to "life" by viewers interacting with the artwork. More importantly, *what we do not see* is the rhetorical software that allows us to understand life as something that can be encoded, recoded, and transferred between media.[65] This understanding of life as software and body as hardware is just the "how" Hayles identifies in *How We Became Posthuman.* It is with this in mind that I dig deeper into the writings of life represented in *Life Writer*.

The Museum of Contemporary Art Tokyo (MOT) is a modestly-sized, but stylishly contemporary building of white stone and steel, built in 1995 (fig. 6). It is nestled between an elegantly angular fountain courtyard and swath of green space in a quiet corner of the Koto ward, east of the bustle of metropolitan Tokyo. In the spring of 2010 its cozy basement galleries were home to "Cyber Arts Japan," an exhibition celebrating the 30th anniversary of the ARS Electronica festival and its special relationship to Japanese artists.[66] It is here, past the large glass cases housing the eccentric electronic instruments ("Nonsense Machines") of Japanese musician-performers Maywa Denki[67]; past the robotic tail that, when strapped to a participant, curls and twitches in concert with the wearer's own movements[68]; and past the clicking, motorized teddy bear who sits on a

[65] *On Beyond Living: Rhetorical Transformations of the Life Sciences*, (Stanford: Stanford University Press, 1997).
[66] See http://www.mot-art-museum.jp/exhibition/cyberarts/
[67] See http://www.maywadenki.com/english/00main_e_content.html
[68] Ryota Kuwakubo, *SiliFulin*

pedestal in front of a digitally projected montage of the videos shot through cameras in its eyes[69]; that one encounters *Life Writer*.

Situated in the center of its own darkened, three-walled room, haloed in a bluish digital glow, *Life Writer* beckons irresistibly (fig. 7). A wooden chair pulled up to the table invites close contact, although the museum attendant has to encourage some of the shyer viewers, reassuring them—often through a brief demonstration—that the chair is indeed to be sat upon, the art interacted with. An antique typewriter rests in the middle of the table, a long sheet of white paper fed through its rollers and curving gracefully over the edge of the table. The paper itself seems to glow brightly, like a screen, though it is in fact illuminated by an overhead digital projector.

The typewriter is a shiny black manual with a silver Royal logo emblazoned above four banks of round glass keys.[70] The keyboard design's open framework reveals the lever beneath each silver-ringed key, as well as the surface of the desk visible between them. Through the central opening in the dust shield above the keyboard, one can see phalanxes of corresponding typebars, their visual and functional symmetry clearly indicating their purpose. A few clues indicate the typewriter's European origin, including the QWERTZ keyboard layout; "umschalter" where an English-speaker would expect to find the word "shift"; and three additional keys for the umlauted vowels Ö, Ä, and Ü. This model, officially called the Royal Portable Standard, but also referred to as the "Model O" after its serial number, or the "Touch Control," after the key tension selector

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[69] Yasushi Noguchi/Hideyuki Ando, *Watch Me!* (http://r-dimension.xsrv.jp/projects_e/watch_me/#more-29)

[70] *Life Writer* exists in multiple iterations, as examinations of the typewriters used in different exhibitions reveal. The piece was first developed for and displayed at the "All Digital" show at the Museum of Contemporary Art in Cleveland (Margo Crutchfield, curator). My comments refer specifically to the installation at CyberArts Japan (an exhibit which overlapped with "Experimenta: Art for the 21st Century" at The Arts Centre, Melbourne.

here located below the Royal insignia, dates from the mid-1930s.[71] Its small scale and enticingly fingertip-sized round keys, positioned to receive input from one hand or two, give it a particularly intimate aesthetic.

This well-preserved, old-fashioned machine provides an interface in contrast with the "cyber" aspect of the work, which plays out on the aforementioned glowing surface of the paper. Despite being nearly a century old, the typewriter retains a familiarity and immediacy absent in similarly-aged technology,[72] due in large part to its unchanged QWERTY key arrangement. Although today's computer keyboards are readily reconfigurable—not constrained by the one-to-one mechanical relationship that characterizes typewriter keys—most of them, including the virtual one on the touchscreen of my own smartphone, keep the QWERTY layout. Given the ubiquity of keyboards in contemporary life, *Life Writer*'s interface is particularly intuitive.

If the integration of antique and contemporary technology is subtly achieved, however, the results are thus perhaps even more striking. The stroke of a key sends the corresponding typebar clacking against the platen, where—if struck with sufficient force, naturally—the expected letter appears on the paper. When the paper is advanced forward in the machine, however, either by turning the platen knob or advancing the line space lever, any similarity to a standard typed page disappears. Hovering above the type guide, the letters appear to take on a life of their own, pausing for a split second on the page before beginning to transform. A series of typed letters melts into one another, shrinking down to a speck before reemerging as an insect-like creature. A single letter drifts and

[71] Alan Seaver, http://machinesoflovinggrace.com/royals.htm (accessed 4/19/2010)
[72] One might consider, for example, the differences between a 1930 telephone and today's cellphones.

spins upward, developing into a simple creature if it is not first summarily devoured by another hungry creature on the page.

The resulting creatures are surprisingly evocative, and definitively buggy (fig. 7). Every creature that develops from the text consists of a body and at least one pair of legs, the flat black silhouettes mirroring the look of the characters from which they evolved. Body size and shape vary, as do the legs; the simplest creature looks at first like a single line, its body the tiny dot connecting the two legs. Others have small bodies with long, articulated legs positioned at the back, making them fast and froglike in their movements; or round bodies with legs sticking straight out to the sides that seem to row across the page, sometimes bumping up against the side of the page and spinning themselves in circles against its edge. Creatures' morphologies—some reminiscent of water striders, others of crabs or spiders—shape their movements. They skitter, swim, limp, crawl, or row through or over each other, swarming in masses around the type guide, from which food—in addition to, and sometimes in the form of, new creatures—emerges when the viewer types letters.

When two compatible creatures meet, they "mate," producing offspring that combines features from each. The meeting between the two is generally very brief, occasionally occurring after what appears to be only the merest crossing of paths. A tiny speck appears between them, developing into a creature that is more complex, and often larger, than either parent, and, depending on the morphology of the two, even asymmetrical. This creature's shape determines its own movement and speed, and its mating with another creature will create an even larger and more complex offspring. As mating occurs very rapidly and the creatures seem generally disinclined to eat others of approximately their own size, a blank page can quickly become filled, particularly at the hands of an enthusiastic typist, with a swirling mass of legs and bodies.

The typist-viewers frequently are quite enthusiastic, once they've crossed—often assisted and encouraged by the attendant—the barrier of understood museum behavior, which generally prescribes that artworks be viewed but not touched. Some strike the keys rapidly, causing the typebars to jam and onlookers to laugh at the excess of energy. The typebars are easily disentangled, however, and such frantic outbursts of text quickly result in the page teeming with a dense mass of creatures. These can be cleared (and frequently are, by an attendant demonstrating the piece to a new viewer) by turning the platen knob to advance the creatures to the far edge of the page. This is technically, of course, to the edge of the projection, which coincides with the point where the paper, supported horizontally thus far by a frame hidden beneath it, hangs off the edge and curls toward the floor. As the creatures reach the edge of the page/projection, they seem to cling there, as if resistant to being rolled into oblivion. A few more clicks, though, and they are gone, the page glowing pristinely in anticipation of the next user's input.

Visibility and Invisibility

Life Writer is a project that seamlessly integrates visible and invisible elements; it consists in *what we do not see*, yet it is first and foremost a work of art. It is its visual elements—the graceful typewriter, the emphatically buggy "creatures"—that are immediately arresting and engaging, with the invisible machinery of only secondary concern. Its power lies in its ability to *show* what we otherwise do not see, and to invite the interaction that highlights it. The history of typewriter design itself has also been concerned with the idea of visibility and non-visibility, to which I turn briefly now.

In his history of the typewriter, *The Writing Machine*, Michael H. Adler describes in detail the proliferation of typewriter designs that flourished between the early part of the nineteenth century and the 1930s, by which point the "standardization on the conventional design had become ubiquitous."[73] By the first years of the twentieth century this design included "front-stroke, type-bar machines with four-row keyboards,"[74] though it also "suffered the severe handicap of non-visible typing."[75] Adler describes an intense debate, in fact, between proponents of "visible" and "blind" machines—that is, whether or not the machine allowed for viewing of the typing produced. No less reputable a reference than the contemporary *Encyclopedia Britannica* (fig. 9) weighed in on the debate, stating in its entry on the typewriter that

> doubtless the novice who is learning the keyboard finds a natural satisfaction in being able to see at a glance that he has struck the key he was aiming at, but to the practical operator it is not a matter of great moment whether the writing is always in view or whether it is only to be seen by moving the carriage, for he should as little need to test the accuracy of his performance by constant inspection as the piano-player needs to look at the notes to discover whether he has struck the right one…[76]

The "visible" design did win out, in what Adler calls a "foregone conclusion," for its superiority as far as error detection and correction and operations such as underlining.

The Royal used in *Life Writer*, following a by-then entirely standardized design (fig. 10), does allow the viewer to see each letter as it is typed, and, as is paradigmatic of the entire project, presents itself as visible in other ways as well. Especially compared to the computer, in which inner workings are hidden from view, the typewriter is itself an

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[73] *The Writing Machine.* Sydney: Allen & Unwin, 1973, 236. Adler writes that "The first machine of modern 'conventional' design, which was to become the prototype of the instrument as we know it today, was the Underwood No. 1 introduced after 1895." (33)
[74] Ibid
[75] Ibid, 43.
[76] Hugh Chisholm, Ed., "Typewriter," *Encyclopædia Britannica*, 11th edition, Volume XXVII, 1911, p. 502.

eminently visible machine. Each key bears a direct correspondence to the letter it produces, which is evident not only in the metal bars extending from beneath each key and directly connecting to the appropriate typebar but in the direct relationship between the force with which a key is a struck and the force with which the letter is impressed on the page. Even the tangle of typebars that results from an overenthusiastic punching of the keys—especially by contemporary fingers, trained in speedy keyboarding by online search and chat—attests to the graceful simplicity of the machine and its ability to translate from fingertip to printed character.

In *Life Writer,* the typewriter's elegant, intuitive design and operation extend into the larger project itself. If one assumes of a typewriter that it will just work—as indeed early user testimonials,[77] as well as the ease with which one can still obtain a functional old-fashioned model, would indicate—it is perhaps surprising to find that the attendant technology, in this case, does as well. In her meditation on literature in new media and medium specificity, *Writing Machines*, N. Katherine Hayles recalls a colleague describing to her the "various outrages to which the computer subjected her"[78]—outrages that would never occur with a printed volume, but were potentially perilously present in a literary work whose medium was digital. Indeed, few of us have been spared subjection to the computer's outrages—a particularly apt term for the singular frustration evoked by the "blind" machine mysteriously, but emphatically, refusing to perform as directed. Yet in *Life Writer*, the technology does, seemingly almost as if by magic, work.

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[77] Adler quotes the following from a Blickensderfer catalog: "'Capt. Gillespie, R.E., who was with the Thibet Expedition, writes from UMBALLA, Punjab, 1st Jan., 1905: "…it accompanied me on the march, travelling on a coolie's back. I used it under all sorts of conditions, in pouring rain, at over 13,000 feet altitude with the rain coming in all over the tent. At least once it was dropped and went rolling down the Khud. I hardly ever cleaned it and worked it very often unfairly… At the end it was writing just as well as at the beginning…"'" Ibid, 40

[78] N. Katherine Hayles, *Writing Machines,* 2002, p. 44. Hayles

When the typebar strikes the platen, it leaves a character on the glowing page, which moves with the paper as if it were actually printed there and not a digital projection. On a standard typewriter, this impression would be mediated by the typewriter ribbon, the ink from which would remain on the paper as the printed character, while the ribbon itself remained visible just below the line of text, ready to ink the next character. Unlike on a standard typewriter, in *Life Writer* there is no ribbon, and thus no physical trace—no matter how faint—of the letters that have been typed. The characters projected onto the page remain letters only until they are advanced up the page, at which point they begin to transform into the tiny, insect-like creatures that soon overrun the glowing surface.

In this "visible" machine, one can instantly see the characters that typing produces, as well as watch those letters transform themselves into lifelike creatures, yet the mechanisms that facilitate these feats of technology are artfully hidden. The writing desk on which the Royal rests, although it varies from installation to installation, is always a simple affair, a four-legged table whose height the artists specify at approximately 70 cm and whose own clean lines and transparency of form further emphasize *Life Writer*'s elegant simplicity.[79] A single cord extends from the back of the typewriter and over the edge of the table before disappearing at the floor. Close inspection reveals other smaller cords connecting works inside the machine with the platen and framework that supports the paper, but even these, their dull silver covering camouflaging them amidst the typewriter's steel components, are integrated so subtly as to be nearly invisible. The overhead projector, bolted to the ceiling, is the most obviously high-tech piece of equipment, yet the audience's attention is far more absorbed with the sheet of paper the

[79] One might contrast this with the elaborate cabinetry of Wolfgang von Kempelen's early—though fraudulent—experiment with "artificial intelligence," his 1770 *Automaton Chess-player*, or *The Turk*.

projector effective turns into a computer screen, and on which most of piece's action occurs. So seamless is the interaction between the analog and digital here—the surface of the paper, and everything on it, corresponding so directly to the users' interactions with the typewriter—that the technology necessary to accomplish it, already subtle, becomes essentially invisible.

Even better hidden—in fact, completely invisible—is what might fancifully be called the soul of the project, the genetic algorithm that animates the creatures and distinguishes them as "artificial life forms." (That very designation itself implies the use of another kind of "software," to which I will return later.) The catalog for the *All Digital* exhibition at the Museum of Contemporary Art Cleveland (2006) even includes "code" among its list of materials for the piece.[80] That code is the invisible link between the text that viewers enter on the keys of the typewriter and the creatures that emerge, individual in morphology, size, and speed, yet highly familiar and evocative in their life-like behavior. The artists write that users' "text is transformed into the DNA of artificial life forms that appear on the real paper of the typewriter,"[81] "genetic" programming that renders them "semi-autonomous and [able to] follow their own internal rules of metabolization and reproduction."[82] This code and its specifications are not revealed to the viewers, nor is it evident by what logic the characters typed turn into the creatures that fill the page. Although longer strings of letters appear to create larger creatures, some randomness also intervenes between the characters typed and the creatures that emerge; the spacing between individual letters in a single string of characters or "word" may mean that

[80]The following specifications are given for *Life Writer*: "Interactive computer installation: computer, code, projector, typewriter, table, chair. Dimensions variable."126
[81] Sommerer & Mignonneau, *Life Writer* DVD.
[82] Ibid.

instead of uniting to form a single character, the letters join, or split, with unpredictable results. This code, invisibly shaping the outcome of the visible text, is integral to understanding these creatures as artificial life forms.

Making Life

Sommerer and Mignonneau met and began their artistic collaboration when they were students at the Städelschule Institute für Neue Medien in Frankfurt, under the mentorship of Professor Peter Weibel. Sommerer had studied botany and modern sculpture, and Mignonneau's background was in "video, improvisation and performance."[83] The two first collaborated on the project *Interactive Plant Growing* (1992), in which viewers could "grow," shape, and create new combinations of three-dimensional virtual plants projected on a screen via their interaction with live, physical, plants in the gallery space. It was the first of many projects that would involve unique and often organic interfaces, situate the physical body in relation to digital technology, and explore the creation and manipulation of "life" in an online environment. It was in their project *A-Volve*, of 1994, that Sommerer and Mignonneau first began deliberately working with the ideas of AL. For this project, they collaborated with biologist and AL researcher Thomas S. Ray.[84]

Ray is perhaps best known for his work on the *Tierra* system, a model of artificial life in which the evolution of a simple string of code inside the designated computer led to a complex "ecosystem" within the simulator's virtual universe. Ray, a tropical biologist who studied biodiversity in the Costa Rican rain forest, was frustrated by the length of time that would be required to observe evolution at work in nature, as well as its

[83] Sommerer and Mignonneau, "Art as a Living System: Interactive Computer Artworks," *LEONARDO*, Vol. 32, No. 3, p. 165
[84] Sommerer and Mignonneau, "A-Volve," in monograph, 76

necessary restriction to life on earth.[85] He designed *Tierra* as "a practical alternative"—as a model of "evolution in a bottle" in which the development of life forms and ecosystems could be closely observed independent of the usual limitations of time and carbon-based life forms. Ray explicitly states that his purpose in creating *Tierra* was "to synthesize rather than simulate life," which necessitated a definition of the latter in "a way that does not restrict it to carbon-based forms."[86] He goes on to do just that, writing simply, "I would consider a system to be living if it is self-replicating, and capable of open-ended evolution. Synthetic life should self-replicate, and evolve structures or processes that were not designed-in or preconceived by the creator."[87] According to his own definition, then, *Tierra* does meet the requirements of a living system.[88] Each creature in the system "consists of a self-replicating assembler language program"—a string of code executed by its own central processing unit (CPU) within the larger virtual computer, and derived from a single "ancestor" program.[89] Ray designed the code paying close attention to the "structural and functional properties of the informational system of biological molecules: DNA, RNA, and proteins."[90] Whereas in molecular biology proteins fit together by shape, in *Tierra* shape is simulated by a binary pattern: the template 1 1 0 1, for example, would find, and fit to, 0 0 1 0.[91] With a mutation function that "randomly flips bits in the

[85] Thomas S. Ray, "An Approach to the Synthesis of Life," in *Artificial Life II* (1990), 371.
[86] Ibid, 372.
[87] Ibid.
[88] Hayles points out, regarding a similar claim by Christopher Langton, "It would be easy to dismiss the claim on the basis that the reasoning behind it is tautological: Langton defines life in such a way as to make sure the programs qualify, and then, because they qualify, he claims they are alive." She goes on to write, however, that "more is at work here than tautology"; the ability to make such an assertion at all underlines "the assumptions that have marked Western philosophical and scientific inquiry at least since Plato. Form can logically be separated from matter; *form defines life*, whereas the material basis merely instantiates life." The claim is not merely tautological, then, but symptomatic of how we imagine life existing. Hayles, 231.
[89] Ray, 374.
[90] Ibid, 376.
[91] Linda Feferman, director, "*Tierra:* Evolution in Another Universe" video, 1995.

soup"[92] and introduces copying errors during the replication process, as well as a "reaper" that culls the oldest/most error-generating creatures to prevent overpopulation, the self-replicating creatures quickly produce a diverse and integrated ecology as they compete for limited resources (in this case, CPU time), developing—based solely on their interactions with each other and with the environment, and not by external direction—varied and often quite complex ecologies. These include configurations of code that Ray calls parasites, hyper-parasites, and even hyper-hyper-parasites: programs that have, without any intervention by Ray, evolved to compete in very specific ways. A parasite, for example, is a program that has lost its own ability to replicate itself, but in turn has gained the ability to latch onto another organism and appropriate its copying procedure. A hyper-parasite has evolved to take advantage of the parasites, waiting to be invaded by one and then using the latter's allotted computer time to accomplish its own replication. Based on her conversations with Ray, Hayles writes that when he "set his program running overnight, he thought he would be lucky to get a 1- or 2-byte variation from the 80-byte ancestor. Checking it the next morning, he found that an entire ecology had evolved, including one 22-byte organism."[93] This story may evoke the image of a petri dish teeming with a rich variety of bacteria after being left alone for a short time, but of course the "ecologies" at play here exist solely as code in a computer—mini-programs running on a larger program.

The world of *Tierra* and the "life" that resides there comprise code inside a computer, but various techniques have been used to make the "creatures" and processes visible. One of the ways *Tierra*'s data have been displayed is through visualizations created by Marc

[92] "An Approach to the Synthesis of Lfe," 379
[93] N. Katherine Hayles, *How We Became Posthuman*, 227.

Cygnus' Artificial Life Monitor (ALmond) program.[94] In these images, each creature is represented by a bar in a grid, its length corresponding to its size (that is, the length of its code, or, its "genome"), and its color to its type—host, parasite, hyper-parasite, etc. A chronological progression of these images, taken at various points during the ecosystem's development, shows the proliferation of various types of organisms and the system's varying composition over time (figs. 11-14). In the captions, Ray narrates the images to tell a story: "Hosts, red, are very common. Parasites, yellow, have appeared but are still rare." "Hosts are now rare because parasites have become very common. Immune hosts, blue, have appeared but are rare." "Immune hosts are increasing in frequency, separating the parasites into the top of memory." "Immune hosts now dominate memory, while parasites and susceptible hosts decline in frequency. The parasites will soon be driven to extinction." This grand dramatic narrative is best described, as Hayles puts it, as "epic."[95]

Whereas the ALmond images translate data into graphic representations, another means altogether was used to visually simulate the actions that occur within *Tierra* for the creation of the short film "*Tierra*: Evolution in Another Universe: (1995). In these digital animations, which Ray and early collaborator Dan Pirone emphasize are merely a way to visualize the processes of *Tierra*, the "creatures" are represented by brightly-colored, toy-like shapes that fit together in three sections, not entirely unlike ants (figs. 12-18).[96] The mutation function is illustrated by periodic flashes of lightning, which

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[94] ALmond visualizations and video stills from "Tierra Photoessay," online at http://life.ou.edu/pubs/images/. Accessed 6/17/10.
[95] Hayles, *How We Became Posthuman*, 229.
[96] On the video, Pirone says, "The visualization you see on the television is an abstraction, where we cut away a lot of the detail, to show the heart of what's happening." Ray adds, "A real significant difference is that the one over here [the ALmond visualization] is driven directly by the simulations, so it's telling us what's going on in the simulation now, whereas this [animation] is just a representation of the concept of the simulation, and it's not connected to the simulation at all." Although at first it sounds as if Ray has confused representation (where the data are transformed into a visibly legible format) with simulation (in

illuminate the scene and contribute to the creation of parasites, which look similar to the original creatures except for their cyan color and generally shorter length. The reaper is illustrated as a solid skull, surrounded by tornado-like swirling lines, which spins over the scene, touching down on selected creatures which then explode.

Tierra is work of science, not of art; visualizations of the project function simply as a way to display and explain the workings of the project itself, otherwise visible only in tables of code. In Sommerer and Mignonneau's artwork *A-Volve*, however, on which they collaborated with Ray, the project consists precisely in what is seen (figs.19- 20). Like *Tierra*, *A-Volve* focuses on the evolution of digital creatures and their fitness within a particular environment, but in the latter, users play a direct role in this evolution, from the creature's appearance to its interaction with other creatures. Sommerer and Mignonneau write that "The concept of *A-Volve* is to let the installation visitors discover how to design good and fit creatures, as the creature's fitness will determine its survival in the pool."[97] Although in *A-Volve,* as in *Tierra,* the creatures exist, on a certain level, primarily as strings of code, their visible manifestation as colorful, moving objects, both makes them seem more life-like and brings them more firmly into the world of the viewers with whom they interact.

Viewers create the three-dimensional creatures in *A-Volve* by drawing on a touch-sensitive screen: first a side view, and then a cross-section. The resulting creature—its color assigned randomly and its texture based on the pressure of the user's touch[98]—is then "born," via a hidden projector, into a small water-filled glass pool (approximately

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which the graphics illustrate a creative imagining of the processes at work), this statement does make sense if one understand s *Tierra* itself as the simulation at work.

[97] Sommerer and Mignonneau, "*A-Volve,*" in monograph, 80.

[98] "*A-Volve*," in monograph, 79.

three feet square), where an overhead video camera detecting users' movements allows them to interact with their creatures (fig. 21). A creature's shape and size influence its speed and movement within the pool, and in turn the creature's "fitness," a value relative to the other occupants of the pool and which establishes whether, in a given pairing, a creature will find itself as predator or prey, as well as its potential mating partners. According to the artists, "a good design will become a fast and fit creature, whereas a poor design will be slow," and a "creature's fitness and swimming speed significantly influence its survival in the pool and how successfully it can reproduce and evolve."[99] Viewers thus have the opportunity to view this evolution in action, and, "given that the visitors spend enough time observing and learning the internal structures of *A-Volve*, the system will become selective based on speed."[100] Fitter creatures will survive to eat, rather than be eaten by, other creatures, and to pass on their genetic material to their offspring.

The genetic material in *A-Volve* consists of each creature's 90-parameter "genetic string," which determines its size, length, shape, color, brightness, and texture, and in turn the way it moves, and thus its speed. Initially, this code is derived from the user's converted input on the touch screen, and in subsequent generations results from "cross-over" between the genetic strings of both parents, with some mutation randomly applied.[101] In the artists' 1996 project *GENMA—Genetic Manipulator*, viewers can once again interact with virtual digital creatures in simulated three-dimensional space, yet in this case, the creatures' genetic code is not only visible, but modifiable: viewers can edit

[99] "*A-Volve*," in monograph, 79.
[100] "*A-Volve*," in monograph, 86.
[101] "*A-Volve*," in monograph, 82.

the creatures' genetic code to effect immediate changes in their appearance.[102] Their project *Life Spacies II* (1999) (figs. 21-22)[103], the direct precursor to *Life Writer,*[104] again focuses on virtual creatures based on genetic codes, but in this case, as in *Life Writer*, those codes derive directly from text entered by viewers. Directly, that is, but not necessarily intuitively: although a longer text message does result in a more complex creature than a short one does, the text's translation into genetic code makes it difficult, if not impossible, to determine the relationship between the content of the text and the creature generated.

The artists write that the "text-to-form editor" they developed to turn visitors' messages into the genetic code of creatures was "based on the idea of linking the characters and syntax of a text to specific parameters in the creature's design."[105] In this process, the computer program first converts each character of the typed message into a standard ASCII value. The resulting integers are then plugged into random seed (rseed) functions that in turn each generate a string of random numbers (or, rather, pseudo-random, as if the same *rseed* is called again, it will generate the same sequence of numbers). These series of numbers are then used to point to specific functions in a 50-item "design function table," each of which modifies the creature's body from the default

[102] "*GENMA—Genetic Manipulator,*" in monograph, 92.
[103] *Life Spacies II* was created as a trimmed-down version of *Life Spacies* that was "more transportable and could be shown in traveling exhibitions." ("*Life Spacies* and *Life Spacies II*," monograph, 105). The original version included "two independent interaction sites linked together via a data line, enabling visitors at remote locations to be displayed and interact within the same virtual three-dimensional space" thanks to cameras that captured each user's image and gestures. (Ibid, 102) In addition, whereas in the first version the creatures were generated via e-mailed messages, in *Life Spacies II,* a laptop at the site with a GUI (graphical user interface) allowed viewers to create and "feed" creatures directly on-site.
[104] Margo Crutchfield, senior curator of the *All Digital* exhibition (2006), writes, "Sommerer and Mignonneau created a more advanced and very different version of *LifeSpacies II* for *All Digital*. Commissioned for the exhibition, this work is titled *LifeWriter* (2006) and represents their latest and most advanced creative effort to date." Crutchfield, 68-69.
[105] "*Life Spacies* and *Life Spacies II*," in monograph, 103. My description of the piece that follows relies on their discussion here.

“module”—a colorless, textureless, basic sphere—into a unique one, its individual complexity based upon the originating text. The creatures, “born” into the virtual environment when the message is sent, seek food to gain energy, which in turn allows them to mate and create offspring. Users can aid creatures by placing food—in the form of text characters (for which each creature has varying individual preferences, based on the letters of its own genetic code)—close to them, thus directly influencing the evolution of the system.

Like *Life Writer, A-Volve* allows users to generate and interact with their digital creations, though the latter allows for much more direct (hands-on, as it were) intervention. In neither project does the viewer see the complex genetic codes that shape the creatures’ behaviors. However, in *Life Writer,* even as the creatures themselves—two-dimensional and monochromatic—are simpler, the faster pace of evolution reveals a greater complexity.

In all of these AL projects, strings of code, whether given visual form or not, are described as “beings,” with lifelike “behaviors” such as eating, mating, and dying. Ray emphatically states that *Tierra* represents *synthesized*, not *simulated*, life; he describes these patterns of action, rather than any “restriction to carbon-based forms,” that constitute life. Sommerer and Mignonneau’s approach is more subtle, invoking the L-word in many of their artworks’ titles, yet largely leaving interpretation of whether or not their projects indeed manufacture life to their audiences. The idea that life can be created in non-organic form is a product of the technology able to serve as its supporting medium, but foremost of the idea that life itself is a coded phenomenon. The earliest AL research, on which I now focus for a moment, explored the idea of life as code far before technology such as the computers used by Ray or Sommerer and Mignonneau existed.

Life as Code: Early AL Research

The origin of AL research is often traced back to John von Neumann, a Hungarian-American physicist and mathematician, who in the early 1950s posed the question: can machines reproduce? As theoretical biologist Claus Emmeche writes in his book *The Garden in The Machine: The Emerging Science of Artificial Life*, von Neumann sought a solution to whether, purely logically, machines could exhibit this oft-cited unique characteristic of life. “Von Neumann had neither the possibility of nor interest in simulating a living system at the biochemical or genetic level,” Emmeche writes. “At that time virtually no one, including von Neumann, knew that DNA was the genetic material. Rather, von Neumann hoped that he could abstract the logical form of process from the natural material self-reproduction.”[106] In order to do this, von Neumann focused on “cellular automata,” themselves an abstraction of machines to their most basic components—a “set of physically unspecified states, input, output, and operational rules.”[107] A cellular automaton, a model suggested to von Neumann by his friend and colleague, the mathematician Stanislaw Ulam, consists of a grid in which each cell changes its own state based on the state of its neighboring cells, according to the rules established for the model. With the initial start pattern and rules established, changes in state occur simultaneously across the entire matrix of cells at every step, with the effect that certain patterns may be interpreted as moving or growing across the grid.

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[106] Claus Emmeche, *The Garden in the Machine: The Emerging Science of Artificial Life* (1994), p. 51.
[107] Emmeche, 53.

Von Neumann's model, a highly complex one in which each cell had twenty-nine potential states, was to be a purely formal logical sequel to his earlier "physical-mechanical" formalization of life processes, which his student Arthur Burks dubbed the "kinematic model" because the imagined apparatus floated about a "pond" of raw materials from which it could fabricate a reproduction of itself.[108] In contrast, later models of AL based on cellular automata provided significantly simpler and more accessible visualizations of the processes von Neumann sought to describe. One of the most popular of these is the "Game of Life," or simply "Life," a game developed by British mathematician John Conway in the 1970s and still popular today (fig. 23). In Conway's model, "cells" are spaces on a grid. Each cell has just two potential states, alive or dead, defined by three rules based upon its eight neighboring cells: a cell with two or three neighboring cells survives to the next "generation"; a cell with more or fewer neighbors dies (of "overpopulation" or "isolation," respectively); and a cell is born into any empty space bordered by exactly three neighbors.[109] Although the game was introduced as one to play on a checkerboard or with graph paper and pencil, Conway also mentions the usefulness of using "a PDP-7 computer with a screen" for observing the changes of longer-lived populations. These days, there are many ways to play the game online, including in HTML5 and Java formats in which one can select one's preferred speed and grid size, as well as participate in active forums for discussing the game and new developments.[110]

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[108] Emmeche, 57, 54-55. See Emmeche and Arthur W. Burks, ed, *Essays on Cellular Automata*, Urbana: University of Illinois Press, 1970.

[109] Gardner, Martin, "The fantastic combinations of John Conway's new solitaire game 'life,' in "Mathematical Games," *Scientific American* 223 (October 1970), 120-123.

[110] One of these new developments was the discovery, as described in *New Scientist* in June of 2010, of a self-reproducing machine in Life, an elaborate program that not only copied itself, but destroyed the original.

These cellular automata are characteristic of AL research generally, which approaches complex problems by reducing them to their most elementary components and working from the bottom up. Whereas research on Artificial Intelligence (AI) has started at the top, so to speak, with attempts to replicate such intelligent human behavior as chess-playing or conversation, AL starts at the bottom, with the most simplified components, and anticipates *emergence*, the process by which lower-level interactions lead to more complex phenomena at higher levels.[111] Both "Bottom-up construction" and "Allowance for emergence" are points in the "seven commandments of artificial life" identified by Emmeche, coming in at commandments five and seven, respectively. The others in his list of characteristics of what he calls "artificial life in its strongest, most ambitious form," are, in order: The biology of the possible (the idea that the study of life needn't be limited to carbon-based forms); Synthetic method (a focus on assembling components to create "life-resembling processes," rather than simply analyzing them); Real (artificial) life (although the parts may be artificial, the systems and behavior are real); All life is form (life is a logical process, and "fundamentally independent of the medium"); and Parallel processing (classical computing runs programs sequentially, but life, and thus AL, depends upon multiple smaller processes running simultaneously).[112]

Emmeche identified these "commandments" based on the vision of AL that began to emerge at the Interdisciplinary Workshop on the Synthesis and Simulation of Living Systems (which came to be known as Artificial Life I), held in September of 1987 at the

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[111] An oft-cited example is Craig Reynolds' "boids," simple virtual birds that exhibit remarkably life-like flocking behavior, including navigating complex obstacles, when programmed to follow three simple rules: "1. Collision Avoidance: avoid collisions with nearby flockmates 2. Velocity Matching: attempt to match velocity with nearby flockmates 3. Flock Centering: attempt to stay close to nearby flockmates." See Reynolds, C.W., "Flocks, Herds, and Schools: A Distributed Behavioral Model." *Computer Graphics,* 21(4):25-34, July 1987.

[112] Emmeche, 17-20.

Los Alamos National Laboratory. The international conference was convened and organized by computer scientist Christopher Langton, who is credited with inventing the label Artificial Life, and who sought to bring together researchers who had been working in relative isolation but shared certain themes in common. Langton's own research examined cellular automata, notably his eponymous Ant—a program in which a computerized "ant," following two simple instructions, leads to complex patterns (fig. 24)—and Loops, self-reproducing automata in which cells have eight potential states (fig. 25).[113] It was at the second of these workshops (Artificial Life II) that Thomas Ray presented his work on the *Tierra* system.

The Meaning of Life

I step backward for a moment, away from the models used to describe or create life, to an even more fundamental shift in understanding what it is that comprises human life. Generating lifelike behavior from artificial materials or considering a program running on a computer as itself life are certainly ways of thinking borne of and shaped by the approach of AL. Yet even before Ray unleashed "evolution" in his PC or von Neumann sought to formulate in mathematical language what characterizes life, changes were occurring in how life was perceived and described. Tracing the roots of some of these changes is instructive for understanding how life came to be seen as formalizable in code, reproducible in a machine, or independent of medium, as is looking at how machines and changing technology have facilitated this thought. This understanding of human life and inheritance as fundamentally encoded lays the basis for the concept of cybernetics, and in turn the cyborg, precursor of the figure of the posthuman.

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[113] See Emmeche, 59.

In 1945, physicist Erwin Schrödinger published a book provocatively entitled *What is Life? The Physical Aspects of the Living Cell.*[114] Although the question of what defines life, or separates the living from the nonliving, is ostensibly within the purview of biologists, Schrödinger sought an answer through his expertise in physics. His conclusion to the question posed in his title was firmly rooted in the gene—that component of the cell that attains "a durability or permanence that borders on the miraculous."[115] Schrödinger outlines the metaphor of "code-script" in the chromosomes, which acts as both "law code and executive power—or to use another simile,… architect's plan and builder's craft in one."[116] For Schrödinger, life is literally encoded in the genes: a set of instructions that not only define and create the individual, but are transmissible through infinite generations.

Evelyn Fox Keller writes that although "Schrödinger, alas, did not find the secret of life," even in his failure, "the very effort of so prominent a physicist to solve so fundamental a biological problem served as powerful inspiration for an entire generation of young physicists and biologists, encouraging them in their own efforts to find the molecular structure of the gene. And soon they succeeded."[117] That solution, cemented with James Watson and Francis Crick's 1953 discovery of the double-helical structure of DNA, came to define an understanding of life based on a gene that, as the title of Keller's book suggests, is both potent and intensely persistent. However, as Keller points out, the gene works much better as an idea than as a physical structure for explaining the secret of life. Schrödinger's code-script is a temptingly neat and tidy metaphor for the cell reading

[114] Erwin Schrödinger, *What is Life? The Physical Aspect of the Living Cell* (Cambridge: The University Press, 1945)
[115] Ibid, p. 49.
[116] Ibid, p. 23.
[117] Keller, p. 21-22.

and executing instructions, and as such has continued to captivate imaginations. Keller emphasizes, however, that although literary models for the gene abound, imagining genetic material as merely a logical, legible code is misleading; in fact, the "body" of the cell itself (supposedly autopoietic via the DNA's instructions) has a strong and largely unknown influence on the proteins created, which is "where computers and organisms part ways."[118] That is, the physical, material, "stuff" of the cell is as important for the growth of the organism as any (imagined) pristine code—a code which, in the case of DNA, continuing research reveals to be far less stable, monolithic, and passive, than itself originally imagined.[119] Keller suggests that the time has come for a new vocabulary, one that both reflects and shapes new thinking in genetics and the life sciences—that sees "gene," for instance, as a term that, while certainly once inspirational as a concept, fails to explain current understandings of how cells and heredity work, and focuses not on static "programs," but on "evolvability" and "developmental robustness."[120]

Richard Doyle also focuses on the role of language in his book *On Beyond Living*, examining the role of rhetoric in shaping what, exactly, "we are studying, when we study life, today."[121] He too looks at Schrödinger's thesis in *What is Life*, contending that by identifying life with a genetic code—a "pattern" encompassing an organism's entire development plus the means for creating the organism—Schrödinger set the stage for science imagining life independent of embodiment. In fact, he claims that rhetorical "tricks" like this are not uncommon, and that they are a result of "the age of World

[118] Ibid, p. 130. "That gene is itself part and parcel of processes defined and brought into existence by the action of a complex self-regulating dynamical system in which, and for which, the inherited DNA provides the crucial and absolutely indispensable raw material, but no more than that." Keller, 71
[119] See especially Keller, chapter 1.
[120] Keller, p. 132
[121] Doyle, p. 2

Scripture," whereby the entire world is seen not just as Heidegger's "world picture," but as transformed into language—"appear[ing] available in its entirety in code."[122]

Doyle traces this encoding impetus through molecular biology, which he claims has tended, from Schrödinger onward, to frame life as code or pattern and, subsequently, the body as mechanical. This leads to what he calls the "postvital body": "the body that fits, and is fitted to, molecular biology."[123] Of this body, Doyle writes:

> While the modern body of the organism announced, through its character and anatomy, the deep unity at work in its depths, the postvital body is a memorial. It is a site of the memory of the modern body, where the characteristics and the behavior of organisms can be found. If under the modern regime life, hidden in the body, was 'perceptible beyond disease,' the postvital body is a transparent sequence that has nothing behind or beyond it.[124]

This flattening and "revealing" of the body in code is an example of what Doyle calls "rhetorical software," the language tools that make invisible certain assumptions while providing the framework to think others. This software facilitates the forgetting of some things and the imagining of others, of which one notable example, to which he devotes the final chapter of his book, is Artificial Life.

Doyle writes that "While the regime of molecular biology, which under Schrödinger, literally forgot the body as it contained it in the code-script, artificial life operates on a memory of the body."[125] Indeed, it operates on a memory of the body in that AL separates the idea of "life" from the physical materiality of bodies, yet ignores that the life it attempts to replicate exists only in, through, and as those very bodies. This

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[122] Doyle, 113
[123] Ibid 8
[124] Ibid, 13
[125] Ibid, 129

erasure of the "stuff"[126] of life in AL parallels the move Keller describes by which the mysterious "stuff" of the cell is rendered invisible in favor of the imagined clear, legible code of the DNA that runs like a computer program. It is "one-half of the central problematic of the rhetorical software of artificial life," Doyle writes, "the knot of contradiction formed when an essentialist project gets intertwined with simulation."[127] To discuss the other half, Doyle turns to Baudrillard, who has famously argued that the real disappears at it is replaced by its simulacra; the real becomes "that of which it is possible to give an equivalent reproduction."[128] Thus, although AL may demonstrate "lifelike behavior," as Doyle writes, "these artificial life constructions are models of nothing, no thing. Vitality, as a contested series of effects rather than a determinate, localizable essence, is the result not of mimesis but of simulation, where simulation need not refer to any stable original."[129] AL, by presenting code and its resultant simulation as life, again reinforces the idea that the physical and material is somehow merely a side effect of life itself—not the stuff of which and from which it *is*.

Thinking Through Machines: AL as Life

From my initial description of *Life Writer*, I have been working my way backward, tracing the philosophical and cultural developments that made possible not just AL projects in science and art, or the mathematical bases for such projects, but the understanding of life that allows these projects to be called "life" at all. I now focus for a

[126] Or the fluff, as in a scene biologist Richard Dawkins relates and Doyle critiques in which cottony cellulose clouds carry the DNA "raining" outside, though the fluff "dwarfs the tiny capsule that contains the DNA, the genetic information.… It is the DNA that matters… The whole performance… is in aid of one thing and one thing only, the spreading of DNA." (quoted in Doyle, 127)
[127] Doyle, 123.
[128] Baudrillard, *Simulations*, Trans. Paul Foss, Paul Patton, and Phillip Beitchman. New York: Semiotext(e), 1983, p. 146. Quoted in Doyle, 124.
[129] Doyle, 124.

moment on how technology itself allows us to understand life and the body—an understanding that has developed and evolved alongside that changing technology.

Understanding DNA as a sort of software run by the cells to create life, and in turn calling computer programs whose own code exhibits lifelike behaviors "alive," are the direct result of increasingly advanced technology, as well as, to use Emmeche's phrase, a certain "landscape of ideas." Emmeche is referring particularly to the influences on von Neumann's thought in determining a logical structure for life, including the work of Alan Turing, Alonzo Church, Kurt Gödel, and Emil Post, and which had, collectively, "led to a crucial new insight: that the essence of a mechanical process was not so much material-physical, as it was its program or control structure, which via an abstract set of rules—a formal specification—could capture the process's functionality."[130] The focus shifted, as it were, from hardware to software.

Technology has long shaped our understanding of the world and particularly of the human body; in her 2007 book *The Enlightenment Cyborg*, Allison Muri points out that metaphors for understanding the body as machine were in play during the Enlightenment and even before. In his *Digital Culture* of 2002, Charlie Gere offers the complementary hypothesis that not only do machines shape thinking, but that certain ways of thinking must precede the technology that actualizes those machines. Gere likewise argues that what he calls digital culture "is neither as new as it might appear, nor is its development ultimately determined by technological advances. It would be more accurate to suggest that digital technology is a product of digital culture, rather than vice versa."[131] Technological developments in the last century have been the product of the thinking

[130] Emmeche, 53.
[131] Charlie Gere, *Digital Culture* (London: Reaktion Books, 2002), p. 13.

demanded by capitalism—in particular, increasing trends toward abstraction, communication, miniaturization and representation—and are particularly indebted to the funding and militarization of WWII. Tracing its roots from developments in the late 18th and early 19th centuries, such as the collection of census data and the development of the Jacquard loom, Gere produces an impressive array of results of and contributions to the developing digital culture, including "avant-garde art practice; counter-cultural techno-utopianism; postmodernist critical theory; [and] new wave subcultural style." [132] These trends in culture have been aided by machines, but have arisen from trends in thought that prefigured the machines themselves.

What, then, does this thinking through machines, from the man-machine of Muri's "Enlightenment cyborg" through Gere's digital culture, mean for the meaning of life—particularly as viewed through the lens of machine-mediated/created A-life? Firstly, depending on one's perspective, understanding AL as life reflects either a very broad or a very narrow idea of what life is. In turn, it may be taken as evidence of either humans' ultimate power over their environments, or of their total inability to recreate, with the apex of their technology, what nature seems to do so effortlessly. It also suggests, in a turn that will be discussed later at greater length, a transferability between "media" of life forms: an inherent essence or impulse that is independent and separable from the medium that supports it, whether carbon or silicon. In the AL projects discussed—*Life Writer*, *Tierra*, *A-Volve*, and *Life Spacies*—I identify three particular elements that comprise the definition of life. Life is understood in each project as, firstly, existing in the individual organisms in the form of the genomic code of each; secondly, in the interactions of the

[132] Ibid, 201.

complex system as a whole; and, finally, in the strategies of visualization that enable the creators to talk about their projects as life.

That the "life" of the organisms is equated with the genetic code that comprises each is perhaps most evident in *Tierra*. This is revealed particularly clearly in a statement Ray makes regarding the "ecosystem" that develops in *Tierra*'s designated computer:

> Most observations on the diversity of Tierran creatures have been based on the diversity of size classes. Creatures of different sizes are clearly genetically different, as their genomes are of different sizes. Different sized creatures would have some difficulty engaging in recombination if they were sexual; thus, it is likely that they would be different species."[133]

Ray's description conflates the genotype and phenotype of the organisms, revealing that the creatures' "bodies" consist solely in code. It also inverts the more typical experience of the world, in which one sees from the different physical characteristics of their bodies that members of two different species are unfit to mate, rather than recognizing this incompatibility from their (invisible) genetic code. This inversion reveals again the rhetorical software at play here, reinforced by what Hayles identifies as the piece's narrative, which includes the aforementioned characters of the ancestor, parasites, and hyper-parasites, as well as a "plot" that describes "the emerging story of the struggle of the 'creatures' for survival and reproduction." Hayles continues, "More than an analogy or an image, this is a drama that, if presented in a different medium, one would not hesitate to identify as an epic."[134] Although Ray does specify that "The 'body' of a digital organism is the information pattern in memory that constitutes its machine

[133] Ray, 390.
[134] Hayles, *Posthuman*, 229.

language program,"[135] understanding these patterns as creatures is essential to understanding *Tierra* as having achieved Ray's goal of "synthesizing life."

In addition to "deploy[ing] a model of the body in which genetic sequences *are* bodies," as Richard Doyle puts it,[136] AL defines life by the interaction of those sequences in complex systems. As discussed earlier, one of the principles of AL is the possibility for *emergence*, which occurs when organisms—or programs—operating by a set of simple rules begin, as a result of their interactions with each other and the environment, to display more complex patterns of organization and/or behavior. Formation of these complex systems is a critical part of the "life" that occurs in Sommerer and Mignonneau's pieces. However, they point out that although there is "now an understanding that when a set of evolving autonomous particles or agents interact, the resulting global system displays emergent collective properties, evolution and critical behavior that have universal characteristics," [137] there exists "no unified complex systems theory or a 'manual' for how to create complex systems as such."[138] In their introduction to *Life Spacies* and *Life Spacies II*, they provide a condensed but extensive overview of the literature on measuring and defining organization in these systems, briefly summarizing theories of complexity ranging from the Kolmogorov-Chaitin-Solomonof definition of Algorithmic Information Complexity to so-called Shannon entropy. They conclude that for their own purposes—"to create a complex interactive artwork that could constantly change, adapt and evolve as users interact with the system"— they were most aided by the theories of Stuart Kauffman and Langton and Packard, which "suggest

[135] Ray, "An Evolutionary Approach," quoted in Hayles, 317, n. 11.
[136] Doyle, 129.
[137] "Life Spacies and Life Spacies II," in monograph, 97.
[138] Ibid, 101.

complex adaptive systems, systems at the 'edge of chaos' where internal changes can be described by a power law distribution."[139]

In Sommerer and Mignonneau's work, such as in *Life Spacies,* the complexity arises from users' input to, and interaction with, the works of art. The artists describe their artistic approach with the phrase "Art as Living System." Here, "Creation is no longer understood as expression of the artists['] inner creativity or 'ingenium' (according to Hegel) but becomes itself an intrinsically dynamic process that represents the interaction between the human observer, his/her consciousness and the evolutionary dynamic and complex image processes of the works."[140] Thus, the code of the "organisms" comprises part of the system's complexity, but itself exists as part of an even larger and more complex system.

The third and final characteristic these AL works share in defining "life" is a strategy of visualization that enables the creators to talk about their projects as such. In the case of *Tierra*, although life ostensibly exists solely in the genetic sequences that comprise the "creatures" and in their interaction with the environment and one another, it is the visualization provided, to some extent by the ALmond images, but to a much greater degree by the animations created to illustrate and promote the system, that the story of the piece as life really takes shape. As Hayles writes,

> To the extent that the 'creatures' are biomorphized, their representation reinforces the strong claim that the 'creatures' are actually alive, extending the implications of the claim. Nor do the transformations appear only in the video, although they are particularly striking there. As the discussion above demonstrates, they are also inscribed in published articles and

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[139] Ibid, 101.
[140] Sommerer and Mignonneau, "Art as Living System," in *Art@Science*, Sommere and Mignonneau, Eds. 148.

> commentary. In fact, they are essential to the strong claim that the computer codes do not merely simulate life but are themselves alive.[141]

These visualizations, Hayles argues, though clearly nonscientific—as Ray and others would also hasten to emphasize[142]—contribute strongly to the piece's narrative of aliveness. Even if understood as merely an illustration of the underlying process in which the *real* life of the piece consists, they make those unseen interactions and evolutions all the more plausible as instances of life in a different medium.

In Sommerer and Mignonneau's pieces, such as *Life Writer*, the creatures' genetic code is manifested only in the projected phenotype, and it is the latter that looks, sometimes startlingly, lively and alive; the emphatic bugginess of the skittering creatures in *Life Writer* causes some viewers to recoil in disgust. This may be "artificial" life, but it *looks* remarkably close to the real thing. These creatures—unlike their colorful, showy *Life Spacies* predecessors, which appear to have more in common with what one might find in Ray's rain forests—are, like their text ancestors, flat and black against the glowing screen. Partly because, as a result, they look like silhouettes, and partly because of their realistic size, however, they are far "buggier" than the *Life Spacies* creatures. Further emphasizing their realism is the way the creatures move, which varies based on their body shape ("Behavior in space is, so to speak, an expression of form," the artists write[143]), but is consistently, convincingly, bug-like.

The idea of behavior is one Hayles criticizes in her analysis of *Tierra*. She writes, "Even granting emergence, it is still a long jump from programs that replicate inside a computer to living organisms. This gap is bridged largely through narratives that map the

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[141] Hayles, *Posthuman*, 230.
[142] See, for example, n. 31.
[143] Sommerer and Mignonneau, "Art as Living System," in *Art@Science*, Sommere and Mignonneau, Eds. 153.

programs into evolutionary scenarios traditionally associated with the behavior of living creatures." She continues that these narratives, which "make sense of the program logic," transform binary operations that "amount to changing electronic polarities… into the high drama of a Darwinian struggle for survival and reproduction." [144] It is in the stories told about *Tierra*, then, and not in the actions within, or outcomes of, the computer program, that life is understood to exist, narratives that Hayles attributes to Ray:

> By representing [the computer codes] as phenotypes, visually by giving them three-dimensional bodies and verbally by calling them 'ancestors,' 'parasites,' and such, Ray elides the difference between behavior, properly restricted to an organism, and execution of a code, applicable to the informational domain. In the process, our assumptions about behavior, in particular our thinking of it as independent action undertaken by purposive agents, are transported into the narrative.[145]

For Hayles, attribution of behavior to the computer codes is a function of the observer's interpretation rather than intrinsic to the program, an interpretation shaped by the language and imagery.

Interestingly, Hayles uses the word "phenotype" to describe the representations of the computer codes, a usage that is not precisely accurate, and one Ray would almost certainly dispute. A phenotype, as described by the Oxford Dictionary of Biology, is "The observable characteristics of an organism. These are determined by its genes (see genotype), the dominance relationships between the alleles, and by the interaction of the genes with the environment."[146] An organism's phenotype is thus the physical expression of its underlying genetic coding, whereas the images in the video were created simply to illustrate the processes in *Tierra*.

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[144] Hayles, 225
[145] Ibid, 229
[146] "phenotype" *A Dictionary of Biology*. Elizabeth Martin and Robert Hine. Oxford University Press, 2008. *Oxford Reference Online*. Oxford University Press. University of Minnesota Law Library. 17 August 2010 http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t6.e3359

In *Life Writer*, on the other hand, the creatures projected on the typewriter's page may genuinely be considered phenotypes. The genetic code derived from the viewers' keyboard inputs corresponds directly to the creatures' morphology and subsequent interaction with the typewriter, page, and other creatures. As in *Tierra*, commonly cited characteristics of life are at play here, including reproduction, mutation, and evolution, but *Life Writer*'s mobile, lively, creatures take AL to an entirely new level: a directly visible one. Instead of code, one sees creatures that consume floating letters or their smaller fellows, and whose offspring clearly resemble a combination of both parents. Whether or not these interactions can be interpreted as "behavior" (which may, in turn, depend upon whether they can be considered organisms), *Life Writer* makes visible a certain way of understanding life—one increasingly emerging from the ideas of Schrödinger's code script, from contemporary molecular biology, and from more recent investigations into Artificial Life. This view of life, together with concurrent and complementary developments in communications and other reach-extending technologies, led to an imagining of the human beyond its current limitations and possibilities: the imaginary, and potential-filled, posthuman.

Serious Cybernetics:[147] The Human as Machine

We arrive now at the crux of this chapter, the point at which ideas of life as code, software as life, and body as machine intertwine in the powerful idea of cybernetics, from which develops the cyborg—the *cyb*ernetic *org*anism of Haraway's metaphor and precursor of the posthuman. Although the artificial life forms that swarm across *Life*

[147] In Adams' *Hitchhiker's Guide* series, the Sirius Cybernetics Corporation is responsible for the majority of the technology in the galaxy, much of it equipped "with the new GPP feature… *Genuine People Personalities*," p. 64.The result is sentient doors, elevators, computers, and more—a frequent source of frustration for their human operators.

Writer's page are perhaps the piece's most striking and immediately engaging (or repulsing) feature, those creatures' origin in language—via the symbolic, abstracting interface of the typewriter keyboard—and the connection they highlight between metaphors of writing and the creation of life, have their roots in the tenets of cybernetics and its attendant technologies of communication and control. I have traced, following Keller and Doyle, the ways in which a conception of the gene as, per Schrödinger, a set of coded instructions, leads to an understanding of life in turn that allows for that code to be labeled, in AL, as life itself. In cybernetics, whose history is closely entwined with that of AL and shares many of the same cultural influences, institutions, and major players, man and machine are first imagined as, at their most fundamental level, compatible and transferrable. This is a large part of the "how" of Hayles' "becoming posthuman," and a potent image will prove tenacious and productive in imagining the posthuman.

In her book *Who Wrote the Book of Life*, published in 2000, historian of science Lily E. Kay examines the scientific and cultural forces at work in shaping the metaphor—an old one, yet transformed in a particular way in the mid-20th century—of the Book of Life, specifically the way it came to be seen as inscribed within the genome. Building on the work of Keller and Doyle (both of whom she cites), as well as many others, Kay provides an in-depth examination of the scientific developments and conversations that framed the development of "a genomic 'Book of Life.'"[148] Kay considers the contributions of individual scientists and institutions that, influenced by wartime and postwar thinking, funding, and technology, catalyzed a cultural shift that began to frame molecular biology as an increasingly cryptographic endeavor. This shift to "information-thinking" led to the

[148] (Stanford: Stanford University Press), p. xv.

development, increasing ubiquity, and eventual literalization of the metaphor of gene as code.[149]

Although the "who" of Kay's title encompasses a large number of research laboratories and individual scientists, from the relatively well-known to those history has tended to leave behind, she makes clear that larger factors were at play in this "writing." Many of the same influences that Charlie Gere identifies as comprising his earlier-discussed "digital culture" background what Kay calls "the postwar world order, [in which] the material, discursive, and social practices of molecular biology were transformed."[150] This new world order was particularly shaped by what she calls the "military-industrial-academic complex,"[151] which continued, even after the war, to provide the bulk of the funding for scientific and communications research. Kay writes that the primary patrons of scientific research in the 1950s were the United States Department of Defense, the Atomic Energy Commission, and the National Aeronautics and Space Administration (NASA). "Monies were spent on nuclear-weapons research, space research, ever-faster electronic computers, germ warfare, biological research on radiation, and techniques of social control, thus placing scientific research in the fields of physical, life, and social sciences at the center of cold-war knowledge production."[152] In addition, Kay continues that molecular biology, and genetics in particular, received significant funding from military sources. [153]

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[149] Kay, xv, 331.
[150] Ibid, 5.
[151] Kay earlier attributes the phrase "industrial-military-academic complex" to Senator J. William Fulbright, and "military-scientific complex" to Admiral Hyman Rickover. Ibid, 11.
[152] Ibid, 10.
[153] "Between 1950 and 1955 the combined support of the AEC [Atomic Energy Commission] and Department of Defense accounted for 53 percent of total federal funds ($120 million) for the biological and medical sciences (excluding agriculture). From 1955 to 1960, military sponsorship stabilized at about 29 percent of the total (now $440 million), as other federal sources, principally the National Institute of Health

Not only did funding from military sources continue, but along with it, Kay argues, a particular state of mind and accompanying rhetoric. During the war, the military's focus had been on defense and code-breaking, one which continued as scientists turned their skills toward attempting to crack the genetic code. Attempts to "break" the genetic code, which is neither language nor cryptograph, necessarily failed, but left the legacy of "a powerful metaphor… [whose] informational and scriptural representations of heredity set roots and proliferated,…[setting] the conceptual framework and discursive structures" that would continue to dominate the field.[154]

Information theory was one of the most important ideas to develop from this milieu and, along with cybernetics, to permanently shape how life, as well as relationships between humans and machines, was understood. One of its founders and a notable code-breaker, whose research moved from top-secret wartime missions to postwar communication studies at Bell Laboratories (which Kay identifies as leading "the industrial sector in volume of military contracts"[155]), was Claude Shannon. In 1948 he published "The Mathematical Theory of Communication," in the *Bell System Technical Journal*, but reached a broader audience the next year with the release of his book of the same title.[156] The latter was co-authored by Warren Weaver, then head of the Natural Sciences division of the Rockefeller Foundation, and contains a long interpretation by

(NIH) but also the National Science Foundation (NSF), NASA, and several private foundations assumed greater roles in funding the biomedical fields. Besides block grants to universities and AEC fellowships, molecular life sciences thrived in the military-AEC sponsored national laboratories, notably Argonne, Brookhaven, and Oak Ridge. The AEC was a major patron of genetics, as John Beatty has documented. In the 1950s the AEC funded half of federally funded genetic research in the United States (as well as many projects worldwide); about 20 percent of the active membership of the Genetic Society of America engaged in AEC-supported research. They were all subject to security clearance and the loyalty oath, as McCarthyism swept through federal institutions." Ibid, 10.

[154] Ibid, 11-12.

[155] Ibid, 91.

[156] Claude Shannon and Warren Weaver. *The Mathematical Theory of Communication.* Urbana: University of Illinois Press, 1949.

Weaver of Shannon's far shorter article. The other founder of information theory was MIT professor of mathematics, Norbert Wiener, whose *Cybernetics* was released the same year and whose name for a time joined Shannon's in the Wiener-Shannon theory of communication.[157]

Shannon's information theory, arising from his work on cryptology and in pursuit of Bell Labs' goal of delivering clear and efficient telephone communication, is, as the title suggests, an approach to understanding the components involved in communication systems as mathematical equations. Although he had been and continued to be concerned with the practical matter of sending messages, this theory deals in the abstract. As he states early in the article, "We wish to consider certain general problems involving communication systems. To do this it is first necessary to represent the various elements involved as mathematical entities, suitably idealized from their physical counterparts."[158] The concern, then, is not with the physical components that comprise a communication system, but rather a schema of their various functions, expressed as equations. The real innovation in Shannon's theory, however, and the idea that would prove the most intriguing and influential across disciplines, was that not just the parts of the communication system, but the message itself, could be separated from not only the medium carrying it, but its very meaning. He writes:

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[157] Kay writes that although their research was conducted independently, the theories expressed in *Cybernetics* and *The Mathematical Theory of Communication* were so similar that Weaver wrote to Wiener, "He [Shannon] is so loyal an admirer of yours that I find it difficult to decide how much of this was really inspired by you, and how much he deserves individual credit for." As far as giving a name to the new science, Kay quotes Wiener's preference "that the theory be called by the names of the two of us or objectively by the names of either of us, but if it comes to a matter of names, I have the right by historical priority to have my name first." Kay continues that although the designation Wiener-Shannon theory of communication did persist for a while, "eventually it was Shannon's positive and powerful formulation that endured." (95).

[158] Shannon, Claude. "A Mathematical Theory of Communication." Reprinted with corrections from *The Bell System Technical Journal,* Vol. 27, pp. 379–423, 623–656, July, October, 1948. Hosted at http://cm.bell-labs.com/cm/ms/what/shannonday/paper.html, 2-3.

> The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have *meaning*; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem. The significant aspect is that the actual message is one *selected from a set* of possible messages.
>
> The system must be designed to operate for each possible selection, not just the one which will actually be chosen since this is unknown at the time of design.[159]

Information in Shannon's information theory is simply the degree of probability that separates it from other potential messages that might be sent, and has no connection to meaning or medium. Weaver further emphasizes this point in the book version of *Mathematical Theory*, writing, "The word 'information' in this theory is used in a special sense that must not be confused with its ordinary usage. In particular, information must not be confused with meaning."[160]

This freeing of information from any material substrate forms a crucial part of the history N. Katherine Hayles describes in her 2000 book *How We Became Posthuman*. The "becoming" she outlines involves what she calls three stories: how information lost its body, how the cyborg was created, and how the liberal humanist subject became today's posthuman. This first move, of seeing information as disembodied—"[s]tripped of context,… a mathematical quantity weightless as sunshine, moving in a rarefied realm of pure probability, not tied down to bodies or material instantiations"[161]—is crucial for the latter two transitions, and certainly doesn't remain solely within the realm of

[159] Shannon, 1
[160] Weaver, quoted in Kay, 14.
[161] Hayles, *HWBP*, 56.

communication theory. Information theory itself, with its intriguing and wide-ranging imaginative potential, was likewise freed from its contextual moorings, over the protests of Shannon, for application in any number of disciplines. "Shannon himself frequently cautioned that the theory was meant to apply only to certain technical situations," Hayles writes,

> not to communication in general. In other circumstances, the theory might have become a dead end, a victim of its own excessive formalization and decontextualization. But not in the post-World War II era. The time was ripe for theories that reified information into a free-floating, decontextualized, quantifiable entity that could serve as the master key unlocking secrets of life and death.[162]

In an era of code-breaking, of triumph of technology, and of unprecedented funding for discovery and knowledge-production, this elegant formulation was destined to spread. Indeed, Kay writes that "The synergy of [Shannon's] concurrent projects—improving the fidelity of information transmission and the design of secret coding systems—seemed to generate a theory applicable, in principle, to any system, physical or biological, in which information can be properly coded, quantified, and manipulated through time and space."[163] Kay's project traces the way the theory was applied to molecular biology; Hayles' focuses on the ways that its privileging of pattern over materiality led to conceptualizations of the body and the self that she defines as posthuman.

The other half of the Wiener-Shannon theory of communications and of the foundation of cybernetics is mathematician Norbert Wiener, who did not share Shannon's compunctions regarding the necessity of keeping information theory context-specific and indeed embraced its application, and the application of cybernetics, across numerous disciplines and areas of study. Wiener, like Shannon, had been employed by the military

[162] Hayles, HWBP, 19.
[163] Kay, 96.

during WWII, where he first developed, as historian of science Peter Galison describes it, the technology that would form the basis of his cybernetic understanding of the mind, body, "vast array of human proprioceptive and electro-physiological feedback systems," and ultimately "the universe itself." [164]This device was the "antiaircraft (AA) predictor (fig. 26), which Galison writes was "designed to characterize an enemy pilot's zigzagging flight, anticipate his future position, and launch an antiaircraft shell to down his plane." Through these complex information feedback loops, Wiener came to see thought, communication, and even the world itself as likewise controlled by the exchange of information. As Galison puts it:

> Where Darwin had assiduously tracked the similarities between human and animal in order to blur the boundary between them, Wiener's efforts were devoted to effacing the distinction between human and machine. Darwin's dog suffered remorse; Wiener's AA predictor had foresight.[165]

In 1943, Wiener co-authored an essay with electrical engineer Julian Bigelow and cardiologist Arturo Rosenblueth, entitled "Behavior, Purpose, and Teleology," in which they define behavior as "any change of an entity with respect to its surroundings," which, in its "purposeful" form, "may be interpreted as directed to the attainment of a goal—i.e., to a final condition in which the behaving object reaches a definite correlation in time or in space with respect to another object or event ."[166] They describe this purposeful behavior, self-guiding as being achievable by machines equipped with feedback servomechanisms. Throughout, the authors draw parallels between the "behavior" and "purpose" of both machines and organisms, at one point even referring to the "main function of the cerebellum [as] the control of the feed-back nervous mechanisms involved

[164] " The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," *Critical Inquiry*, Vol. 21, No. 1 (Autumn, 1994), 229. Online at http://www.jstor.org/stable/1343893.
[165] Galison, 245-6.
[166] In *Philosophy of Science*, Vol. 10, No. 1 (January 1943), 18.

in purposeful motor activity."[167] In 1950 Brown University philosopher Richard Taylor, responding in the same venue, took issue with the idea that machines could ever be meaningfully judged, based upon their behavior, as "intrinsically purposeful"[168]—that even a "target-seeking" missile, as in the example given by Wiener, et. al, is guided by sound waves emanating from its particular object and not "seeking" the target at all.

In their response, published in the same volume, Wiener and Rosenblueth offer their most emphatic defense yet of machine behavior—and of organic/machinic parallelism. They conclude their essay:

> We also wish to explain why we use the humanistic terms purpose and teleology in the description of the behavior of some machines. The question of whether machines are or can be like men or the higher animals does not guide our choice. This question is on the main irrelevant for scientific objectives. We believe that men and other animals are like machines from the scientific standpoint because we believe that the only fruitful methods for the study of human and animal behavior are the methods applicable to the behavior of mechanical objects as well. Thus, our main reason for selecting the terms in question was to emphasize that, as objects of scientific enquiry, humans do not differ from machines.[169]

For the purpose of science, that is, it doesn't matter why machines or organisms exhibit certain actions (though Wiener and Rosenblueth strongly defend that machines do, in fact, exhibit purposeful behavior)—only that the "programming" underlying them are not fundamentally different: *humans do not differ from machines.*

Galison points out that it is crucial that this assertion, like the development of cybernetics itself, came from a specifically martial origin; "Wiener's image of the human and natural world is, in the end," he writes, "a globalized, even metaphysical, extension of the epochal struggle between the implacable enemy from the sky and the Allies'

[167] Ibid, 20.
[168] In *Philosophy of Science*, Vol. 17, No. 4 (October, 1950), 317.
[169] "Purposeful and Non-Purposeful Behavior, in *Philosophy of Science*, Vol. 17, No. 4 (October, 1950), 326.`

calculating AA predictor that did battle from the ground."[170] Remnants of the unknowability of the enemy remain in Wiener's cybernetic formulation of the mind as a "black box" (a term, according to Galison, derived from the boxes housing radar equipment during the war and in Wiener's formulation representative of "a unit designed to perform a function before one knew how it functioned") and of the world as information exchange between other black boxes.[171] Wiener, deeply shaken by the usage of the nuclear bombs and the blame he might deserve for his involvement, was not exactly rosy about the future of this cybernetic world.

Time magazine's January 23, 1950 feature story, "The Thinking Machine" (its cover bearing a whimsical "portrait" of the Mark III computer), focuses on the rise of computers, and Wiener's (rather dark) view of the future they portend (fig. 27). The article cites Wiener as pointing out that "The newest machines… already have an extraordinary resemblance to the human brain, both in structure and function." Though they lack "senses or 'effectors' (arms and legs)," it continues, "there are all sorts of artificial eyes, ears and fingertips (thermometers, strain gauges, pressure indicators, photo-electric tubes) that may be hooked up to the machines,"[172] allowing them to operate not just the typewriters they already do, but "valves, switches and all of the other control devices common in modern industry."[173] Such development, bound to occur, would mark, in Wiener's words,

> 'the second industrial revolution,' which will devalue the human brain as the first industrial revolution devalued the human arm. He points out that only a few hand workers can now compete with power-driven machines.

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[170] Galison, 265.
[171] Ibid, 246-7, 256.
[172] "The Thinking Machine," *Time* magazine, Vol. 55, No. 4 (January, 1950). http://www.time.com/time/subscriber/article/0,33009,858601-4,00.html
[173] Ibid.

> Soon, he warns, there will be wholly automatic factories with artificial brains keeping track of every process. They will order raw materials, inspect them, store them, route them through the plant. They will pay bills, blow the factory whistle and pay the help (if any). [174]

With computers artificial human brains that can be equipped with sensors and actuators for more efficient working, there seems to be little hope for the meager, weakly human. It's a familiar story; the article even mentions *R.U.R*, the tale of robot uprising that I discuss in further depth in Chapter 4. If Weiner's predictions of factories run by artificial brains haven't come to fruition, however, his legacy of understanding humans as machines, and vice-versa, has been instrumental in the conception of the cyborg, to which I've continued to return to as a useful metaphor. That legacy of the idea of human-machine interchangeability has emerged more recently—and seems to echo some of his direr predictions—in the more recent idea of the Singularity.

The Singularity

I wish to conclude this already rather protracted history with one more idea about living in the future, one that also allows me to touch briefly on two aspects that have shaped my own worldview and thinking on the posthuman: eschatology and correctibility. This is the Singularity movement, one of the more extreme projections of the cybernetic legacy. Again, *Time* magazine steps in to gloss the topic for the masses, dedicating their February 21, 2011 feature story to the topic. The cover (fig. 27) features an image of an androgynous, hairless human head, chalky white and with a woven metal cable emerging from a port at the base of the skull, illuminated by the single LED

[174] Ibid. A recent NPR story, more than half a century after Wiener's *Time* predictions, describes a top-of-the-line spinach harvester designed to ease looming farmworker labor shortages. At a quarter of a million dollars, however, although half the price the Mark III was in 1950, at least one farmer recorded for the story still worries whether it will get the job done: "It's very difficult to duplicate the eyes and the feel of a worker when it comes to maturity and quality of the crop." Kirk Sigler, "Why An Immigration Deal Won't Solve The Farmworker Shortage," *All Things Considered*, April 30, 2013.

glowing greenly just above it (fig. 28). Emblazoned across the image is the headline "2045: The Year Man Becomes Immortal." A red asterisk at the end of the line leads the reader to the lower right-hand corner of the cover, where smaller text reads, "*If you believe humans and machines will become one. Welcome to the Singularity movement." The cover story focuses on futurist Ray Kurzweil, and his belief that, in the words of author Lev Grossman, *Time*'s book critic and technology writer, "we're approaching a moment when computers will become intelligent, and not just intelligent but more intelligent than humans. When that happens, humanity—our bodies, our minds, our civilization—will be completely and irreversibly transformed."[175] The label "singularity," borrowed, Grossman says, from astrophysics, indicates "a point in space-time—for example, inside a black hole—at which the rules of ordinary physics do not apply."[176] It is impossible, that is, to predict what would follow the moment in which machine intelligence outstripped human intelligence, changing all the rules.

Grossman quotes computer scientist and sci-fi author Vernor Vinge as declaring, at a 1993 NASA symposium, that "within 30 years, we will have the technological means to create superhuman intelligence. Shortly after, the human era will be ended." Indeed, the title of Vinge's paper, delivered at the NASA-sponsored VISION-21 symposium, and from which the previous sentences were drawn, is "The Coming Singularity: How to Survive in the Post-Human Era."[177] In case the "how to survive" of the title didn't give it away, Vinge is not particularly optimistic about the prospects for human life after the rise of superhuman intelligence. He imagines several possibilities, ranging from the worst-

[175] Lev Grossman, "2045: The Year Man Becomes Immortal." Archived online at http://www.time.com/time/magazine/article/0,9171,2048299,00.html.
[176] Ibid.
[177] Archived online at http://www-rohan.sdsu.edu/faculty/vinge/misc/singularity.html.

case scenario of “the physical extinction of the human race” to the best-case scenario of a “golden age” of development, with the possibility of human immortality. Even in the “brightest and kindest world” of the latter, however, Vinge points out philosophical problems: an immortal mind that remains at a fixed capacity would ultimately become little more than a “repeating tape loop;” one with the capacity to grow would become a very different entity than whatever it was at the beginning, with little affinity for that past self.

If my perspective on living in the future is shaped by my birth in the early 1980s and the attendant experience borne of using such rapidly developing technologies, it is also influenced by the guiding paradigm that the world was going to end—soon. I was raised in a church tradition that has been expecting the Second Coming of Christ, and with it the destruction of the world as we know it, since its formation in the mid-nineteenth century. Though the world would be destroyed, however, believers would be granted immortality; in the words of the Apostle Paul:

> Behold, I shew you a mystery; We shall not all sleep, but we shall all be changed,
> In a moment, in the twinkling of an eye, at the last trump: for the trumpet shall sound, and the dead shall be raised incorruptible, and we shall be changed.
> For this corruptible must put on incorruption, and this mortal must put on immortality.[178]

This tradition, then, while expecting the destruction of the known world, was also looking forward to a singularity of sorts: a change, in the twinkling of an eye, of what it means to be human. As this change would occur at the end of a period of suffering and tribulation, it was anticipated with as much anxiety as excitement. A dark vision of the future is

[178] *The Holy Bible: King James Version*, 1 Corinthians 15:52-3.

certainly not limited to Christians, though the historical pervasiveness of Christian thought in American culture suggests that its legacy may be at least partially to blame.

Time produced a Web video that accompanies Grossman's article, with a title that highlights and pokes fun at this persistent fear response: "Singularity: How Scared Should We Be?"[179] In it, self-proclaimed "science comedian" Brian Malow points out that our popular culture imaginings suggest we believe "our creations will turn against us"—whether from our "psychology of abuse," guilty conscience, or fear of Frankensteinian overreach. This mythology cautions against the hubris that would result in our own destruction at the hands of such creations—though, given the generally triumphant endings of such films, film theorist R.L. Rutsky and others have identified these stories as particularly *humanist*.[180]

Indeed, if the Singularity is primarily concerned with the ascension of superhuman intelligence, it nonetheless contains distinctly humanist aspects, particularly in the concept of human perfectibility—or at least correctibility. Grossman writes that at the 2010 Singularity Summit, held by the Singularity Institute for Artificial Intelligence, "the most-talked about topic," after AI itself, "was life extension." He explains, "Biological boundaries that most people think of as permanent and inevitable. Singularitarians see as merely intractable but solvable problems. Death is one of them. Old age is an illness like any other, and what do you do with illnesses? You cure them."[181] The computer models that Adams identifies as helping us understand what life is—where we came from, what we're made from—cause people like gerontologist and theoretician Aubrey de Grey to

[179] Produced and recorded by Craig Duff for *Time* Video, Jim Fields, Editor, February 10, 2010. http://www.time.com/time/video/player/0,32068,784887564001_2048332,00.html.
[180] *High Technē: Art and Technology from the Machine Aesthetic to the Posthuma*. (Minneapolis: University of Minnesota Press, 1999).
[181] Grossman, 46.

view aging as unnecessary and preventable. “People have begun to realize,” Grossman quotes him as saying,

> that the view of aging being something immutable—rather like the heat death of the universe—is simply ridiculous. It’s just childish. The human body is a machine that has a bunch of functions, and it accumulates various types of damage as a side effect of the normal function of the machine. Therefore in principal that damage can be repaired periodically.[182]

De Grey’s assertion that the body is a machine is certainly a more believable prospect that it might have been before technology made the leaps visible over simply the past three decades—becoming smaller, faster, and more pervasive.

I’ve long been fascinated by the idea of the body being, if not perfectible, at least correctible, having begun my own corrections at a young age. I was prescribed my first pair of glasses at eight, and contact lenses at nine. A few years later, my parents took me to an orthodontist who fitted me with a palatal expander, headgear, and braces. I was made aware of the significance of this venture: my mother, the eldest of four children, had longed for braces but had had to settle for a retainer with a rubber band instead of a guiding wire; my father *had* had braces, in the dark days of the early 1960s when a full metal band encircled each tooth. The braces my siblings and I wore represented advances in technology as well as our parents’ histories. I also felt particularly linked to the past through my corrected vision, realizing that, uncorrected, my eyesight (which deteriorated as I grew) would have rendered me an invalid in a less technologically advanced age. Thanks to modern optometry, I was able to enjoy life as a fully sighted person despite my physiological failings.

[182] Ibid, 47.

The obsession with correcting and improving the body goes beyond my personal fascination, deep into American culture. A rash of so-called reality television shows released over the past decade have focused on beautification through makeovers of clothing, hair, and cosmetics; weight-loss; and even surgery. Among the most radical of these are ABC's *Extreme Makeover*, which ran between 2002 and 2007, and E!'s *The Swan*, which ran between 2004 and 2005. In both cases, participants undergo invasive and occasionally dangerous procedures (revealed, somewhat graphically, for the viewing audience, though the "swan" isn't allowed even a mirror) to better match societal beauty norms.[183] Though the desire for beautification is nothing new, the means of achieving it—as highlighted in these shows—are: cosmetic injections, laser resurfacing, plastic surgery, LASIK vision correction, cosmetic dentistry, and more. The message of these shows is that an ideal of beauty and youthfulness is achievable, no matter what one is born with. Living in the future, with its increasingly-accessible technologies of youth and beauty, means there is no need to be constrained by one's given face or body. In the following chapter, I examine this idea—pushed in a rather different direction—in more depth through the work of the French performance Orlan.

We are, it bears repeating once more, living in the future. This idea is not a new one, though the pace of acceleration in the technology we use daily, namely our phones and computers, has certainly increased to an unprecedented pace, intensifying the sensation

[183] Half an episode, posted on the plastic surgeon's YouTube channel, was all I could stomach of *The Swan*. What is horrifying isn't the graphicness of the operations or their aftermath, but the way the "ugly duckling" is ostensibly humanized through the repeated telling of her story (in this case, her experience of seeing her husband kiss another woman and her failure to do anything because of her fear no one else would love her), and then immediately dehumanized (through the assembled professionals' coldly clinical group assessments of her body after she leaves, and later their treatment of it while she lies unconscious on the operating table). Though teary interview clips of both her and her husband paint her as a rather tragic Individual, her final look is distinctly generic. Randal Haworth, "Swan Beth After Liposuction, Boob Job, Nose Job, Brow Lift, Eye Lift, Lip Augmentation by Dr. Haworth," uploaded on February 1, 2012. http://www.youtube.com/watch?v=7JIT0uZ3D9E

(if current trends hold, my Samsung Rant, a functioning antique at its retirement after only four years, will be my last phone to have lasted that long). As early as 1970, futurist Alvin Toffler described an effect he identified as "future shock," which, like its namesake culture shock, was characterized by the "shattering stress" [184] due to "the superimposition of a new culture on an old one"—even when that old one is in the same location.[185] "Future shock," Toffler writes, "is the dizzying disorientation brought on by the premature arrival of the future. It may well be the most important disease of tomorrow."[186] Our future of today, as well as the disease of tomorrow, are the direct result of a technological boom in the middle of last century, the story to which I have attended as I traced the history of *Life Writer*, and particularly its use of AL. That story continues in the chapters that follow.

[184] *Future Shock* (New York: Random House, Inc., 1970), 2.
[185] Ibid, 11.
[186] Ibid, 11.

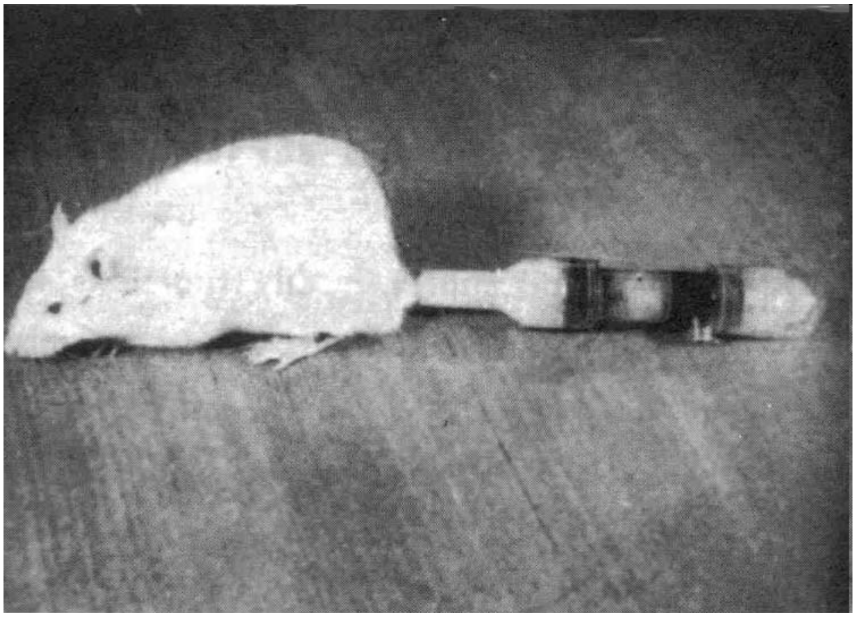


Figure 1.1 Manfred Clynes and Nathan Kline's "Cyborg," 1960


Figure 1.2 Allan Kaprow, *18 Happenings in 6 Parts* (the artist during the performance)

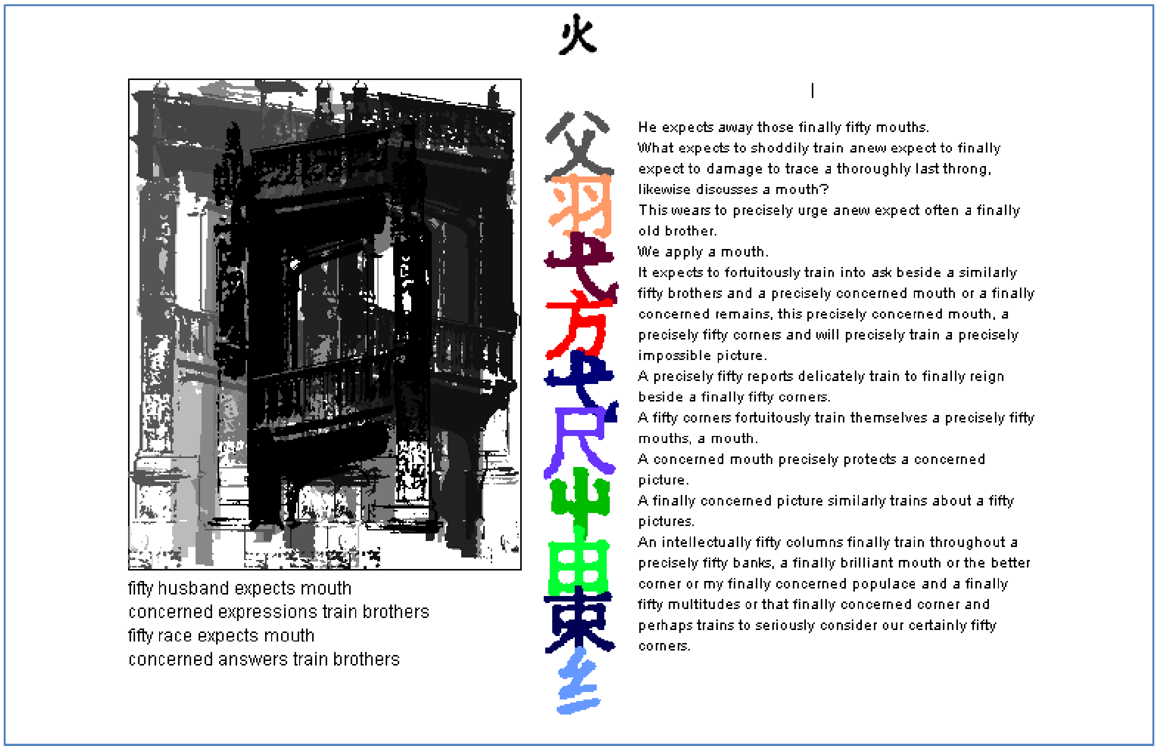


Figure 1.3 Simon Biggs, Great Wall of China (screenshot), 1999.

Figure 1.4 "Eduardo Kac and Alba, the fluorescent bunny." Photograph by Chrystelle Fontaine.

Figure 1.5 Sommerer & Mignonneau. *Life Writer,* Museum of Contemporary Art, Tokyo, March 20, 2010.

Figure 1.6 Entrance, Museum of Contemporary Art, Tokyo. March 20, 2010.

Figure 1.7 Sommerer and Mignonneau, *Life Writer*, Museum of Contemporary Art, Tokyo, March 20, 2010.

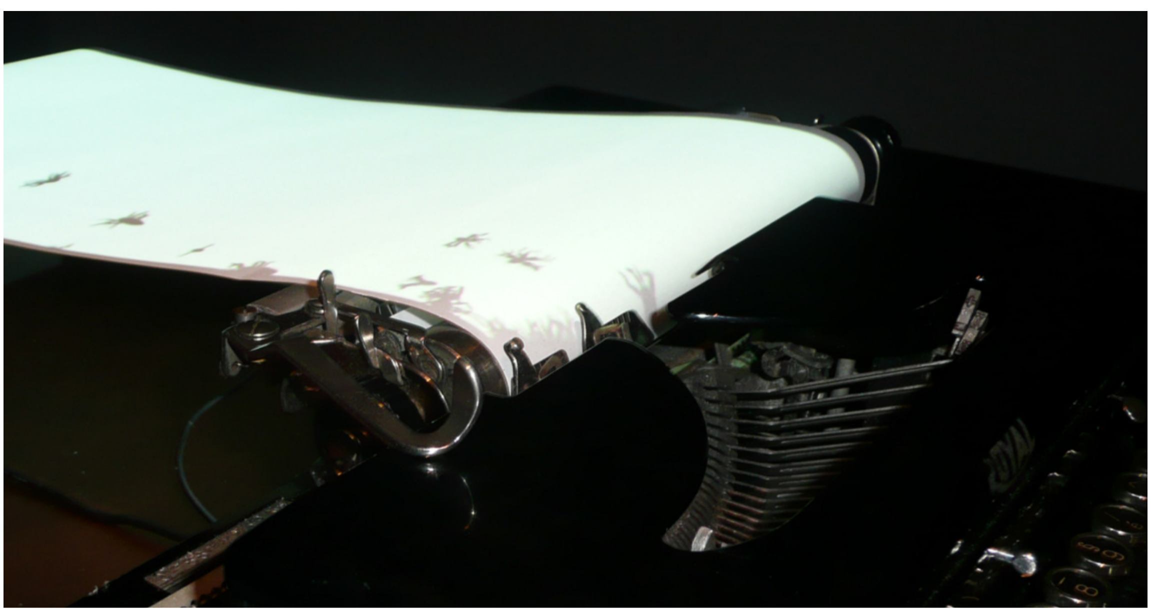
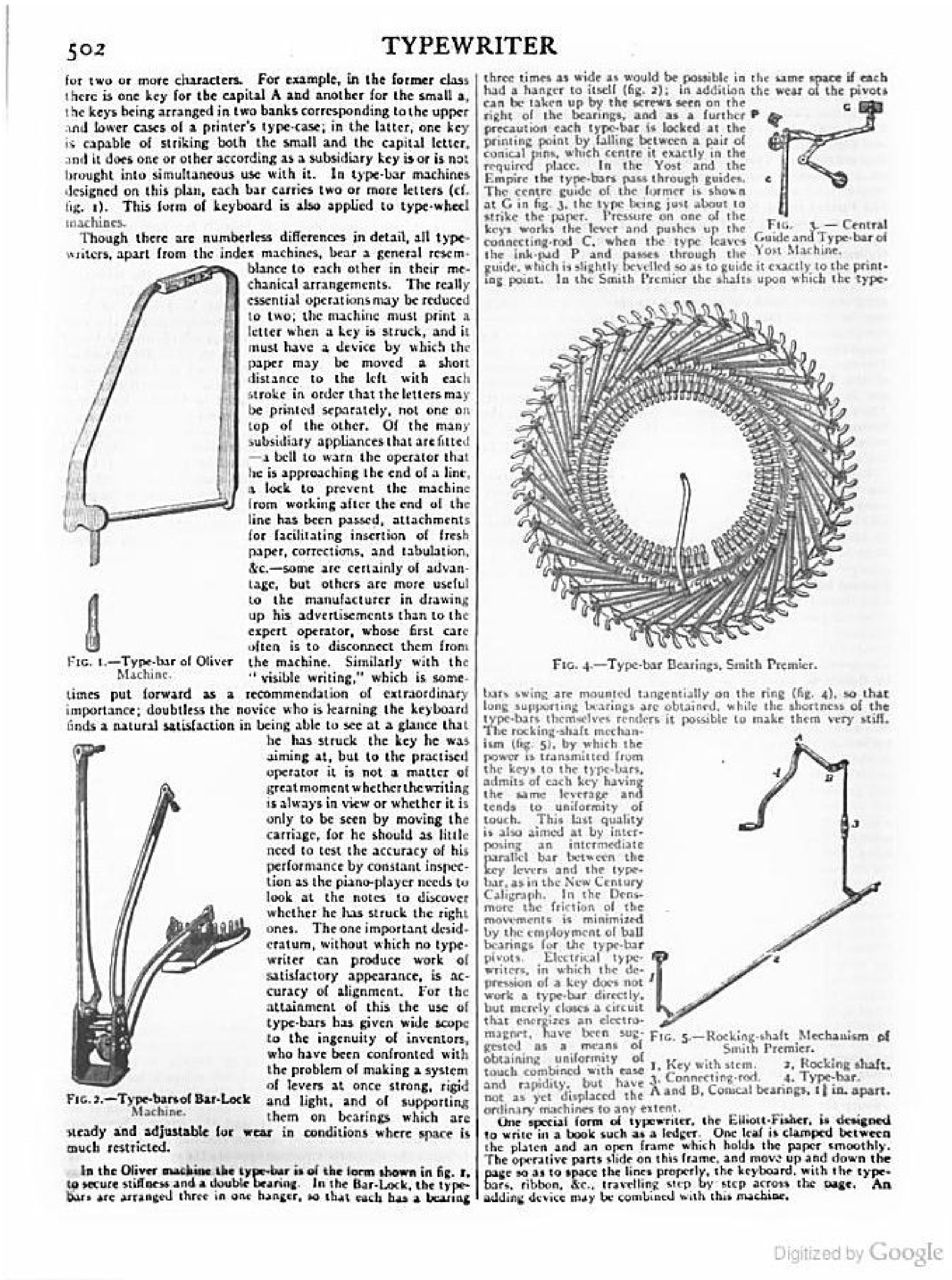


Figure 1.8 Sommerer and Mignonneau, *Life Writer* (detail of "bugs"), Museum of Contemporary Art, Tokyo, March 20, 2010.



502 TYPEWRITER

for two or more characters. For example, in the former class there is one key for the capital A and another for the small a, the keys being arranged in two banks corresponding to the upper and lower cases of a printer's type-case; in the latter, one key is capable of striking both the small and the capital letter, and it does one or other according as a subsidiary key is or is not brought into simultaneous use with it. In type-bar machines designed on this plan, each bar carries two or more letters (cf. fig. 1). This form of keyboard is also applied to type-wheel machines.

Though there are numberless differences in detail, all typewriters, apart from the index machines, bear a general resemblance to each other in their mechanical arrangements. The really essential operations may be reduced to two; the machine must print a letter when a key is struck, and it must have a device by which the paper may be moved a short distance to the left with each stroke in order that the letters may be printed separately, not one on top of the other. Of the many subsidiary appliances that are fitted—a bell to warn the operator that he is approaching the end of a line, a lock to prevent the machine from working after the end of the line has been passed, attachments for facilitating insertion of fresh paper, corrections, and tabulation, &c.—some are certainly of advantage, but others are more useful to the manufacturer in drawing up his advertisements than to the expert operator, whose first care often is to disconnect them from the machine. Similarly with the "visible writing," which is sometimes put forward as a recommendation of extraordinary importance; doubtless the novice who is learning the keyboard finds a natural satisfaction in being able to see at a glance that he has struck the key he was aiming at, but to the practised operator it is not a matter of great moment whether the writing is always in view or whether it is only to be seen by moving the carriage, for he should as little need to test the accuracy of his performance by constant inspection as the piano-player needs to look at the notes to discover whether he has struck the right ones. The one important desideratum, without which no typewriter can produce work of satisfactory appearance, is accuracy of alignment. For the attainment of this the use of type-bars has given wide scope to the ingenuity of inventors, who have been confronted with the problem of making a system of levers at once strong, rigid and light, and of supporting them on bearings which are steady and adjustable for wear in conditions where space is much restricted.

FIG. 1.—Type-bar of Oliver Machine.

FIG. 2.—Type-bars of Bar-Lock Machine.

In the Oliver machine the type-bar is of the form shown in fig. 1, to secure stiffness and a double bearing. In the Bar-Lock, the type-bars are arranged three in one hanger, so that each has a bearing three times as wide as would be possible in the same space if each had a hanger to itself (fig. 2); in addition the wear of the pivots can be taken up by the screws seen on the right of the bearings, and as a further precaution each type-bar is locked at the printing point by falling between a pair of conical pins, which centre it exactly in the required place. In the Yost and the Empire the type-bars pass through guides. The centre guide of the former is shown at G in fig. 3, the type being just about to strike the paper. Pressure on one of the keys works the lever and pushes up the connecting-rod C, when the type leaves the ink-pad P and passes through the guide, which is slightly bevelled so as to guide it exactly to the printing point. In the Smith Premier the shafts upon which the type-bars swing are mounted tangentially on the ring (fig. 4), so that long supporting bearings are obtained, while the shortness of the type-bars themselves renders it possible to make them very stiff. The rocking-shaft mechanism (fig. 5), by which the power is transmitted from the keys to the type-bars, admits of each key having the same leverage and tends to uniformity of touch. This last quality is also aimed at by interposing an intermediate parallel bar between the key levers and the type-bar, as in the New Century Caligraph. In the Densmore the friction of the movements is minimized by the employment of ball bearings for the type-bar pivots. Electrical typewriters, in which the depression of a key does not work a type-bar directly, but merely closes a circuit that energizes an electro-magnet, have been suggested as a means of obtaining uniformity of touch combined with ease and rapidity, but have not as yet displaced the ordinary machines to any extent.

FIG. 3.—Central Guide and Type-bar of Yost Machine.

FIG. 4.—Type-bar Bearings, Smith Premier.

FIG. 5.—Rocking-shaft Mechanism of Smith Premier.

1. Key with stem. 2. Rocking shaft.
3. Connecting-rod. 4. Type-bar.
A and B, Conical bearings, 1½ in. apart.

One special form of typewriter, the Elliott-Fisher, is designed to write in a book such as a ledger. One leaf is clamped between the platen and an open frame which holds the paper smoothly. The operative parts slide on this frame, and move up and down the page so as to space the lines properly, the keyboard, with the type-bars, ribbon, &c., travelling step by step across the page. An adding device may be combined with this machine.

Figure 1.9 "Typewriter," Encyclopedia Britannica, 1911.Digitized and hosted online by Google Books. http://books.google.com/books?id=yf0a3OFlq3sC&pg=PA502&dq

Figure 1.10 Royal Portable Standard, Serial # O-605667, 1936. http://machinesoflovinggrace.com/royals.htm

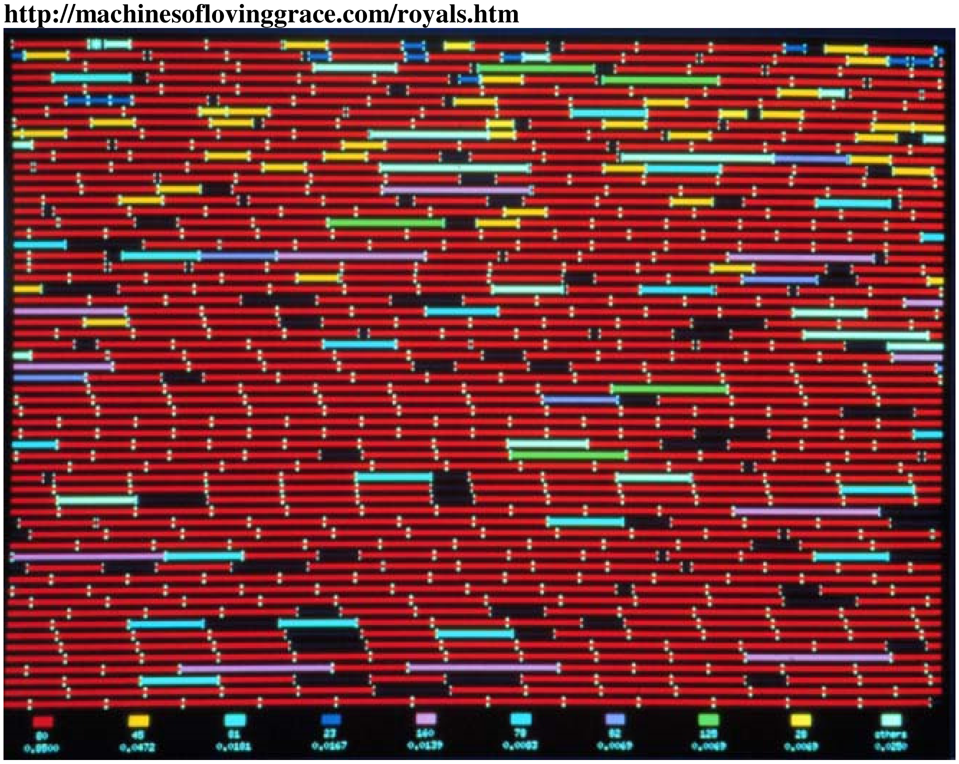


Figure 1.11 Marc Cygnus, ALmond visualization of Tierra. "Hosts, red, are very common. Parasites, yellow, have appeared but are still rare."

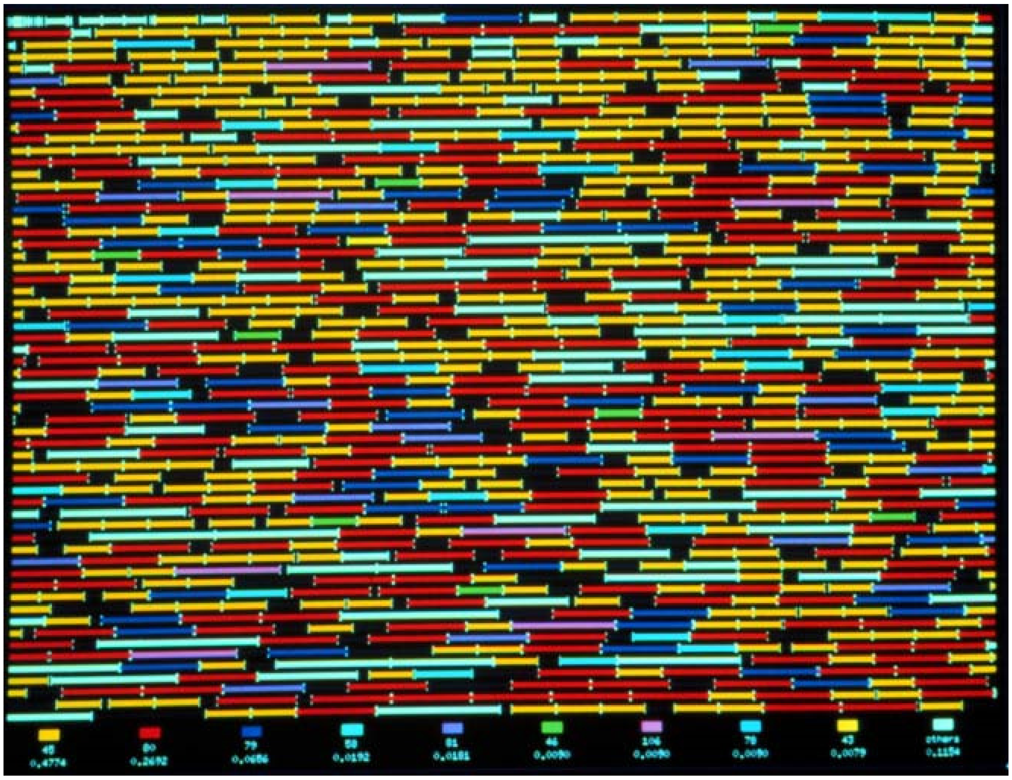


Figure 1.12 Marc Cygnus, ALmond visualization of Tierra. "Hosts, are now rare because parasites have become very common. Immune hosts, blue, have appeared but are rare."

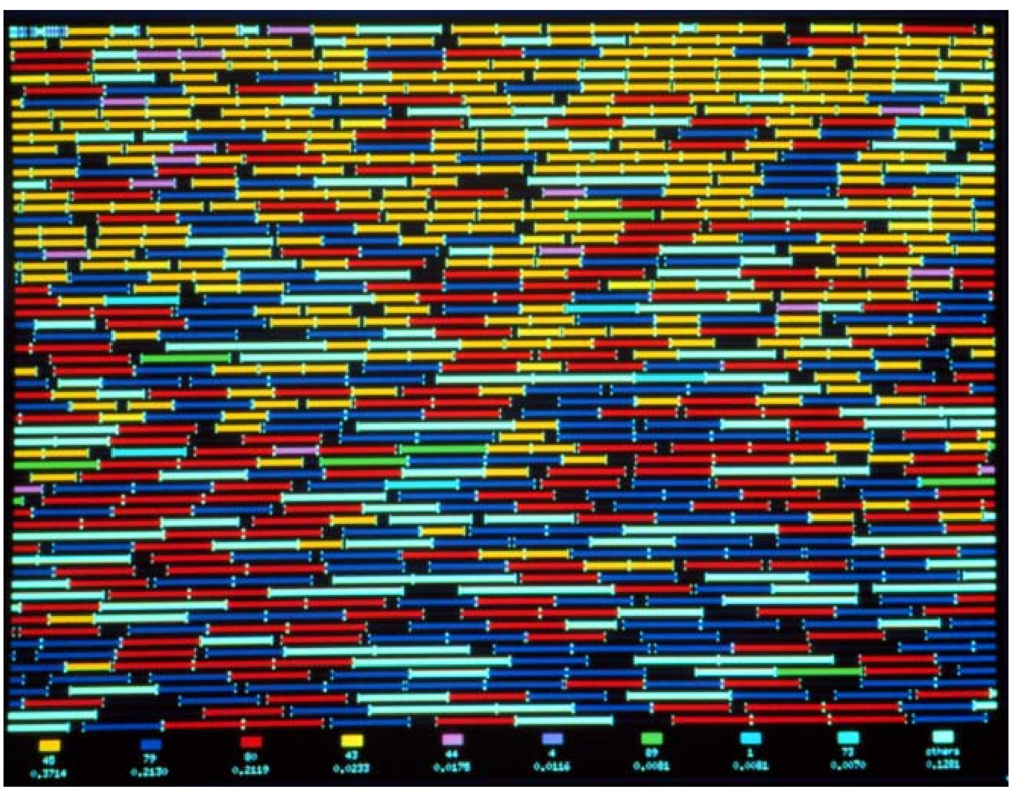


Figure 1.13 Marc Cygnus, ALmond visualization of Tierra. "Immune hosts are increasing in frequency, separating the parasites into the top of memory."

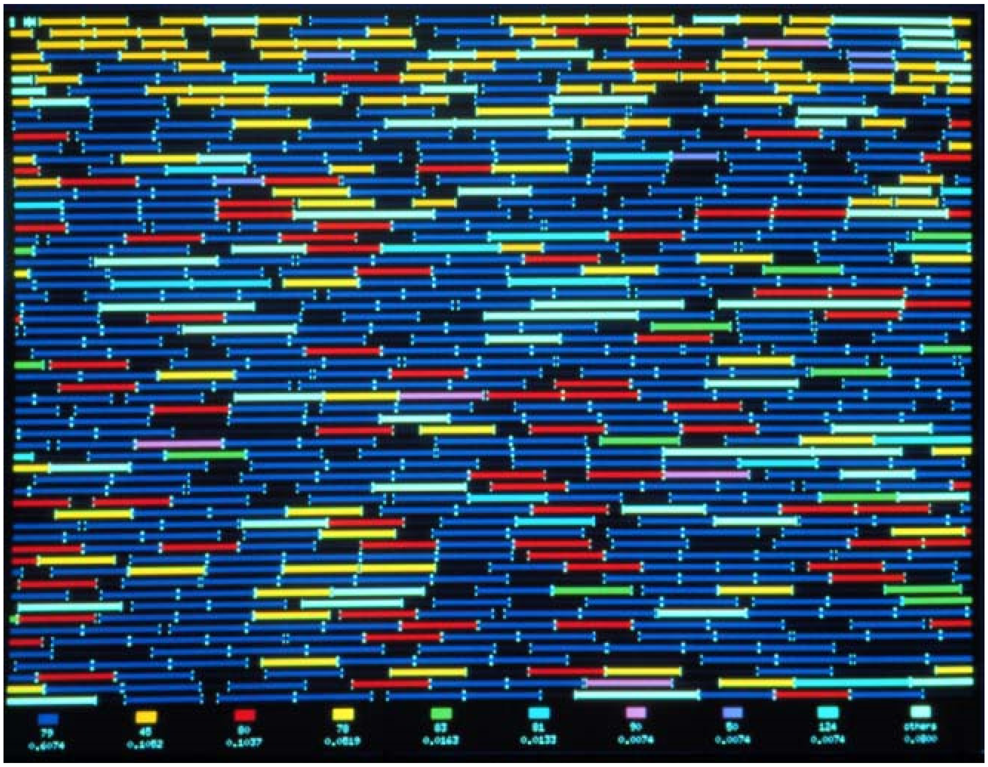


Figure 1.14 Marc Cygnus, ALmond visualization of Tierra. "Immune hosts now dominate memory, while parasites and susceptible hosts decline in frequency. The parasites will soon be driven to extinction. "

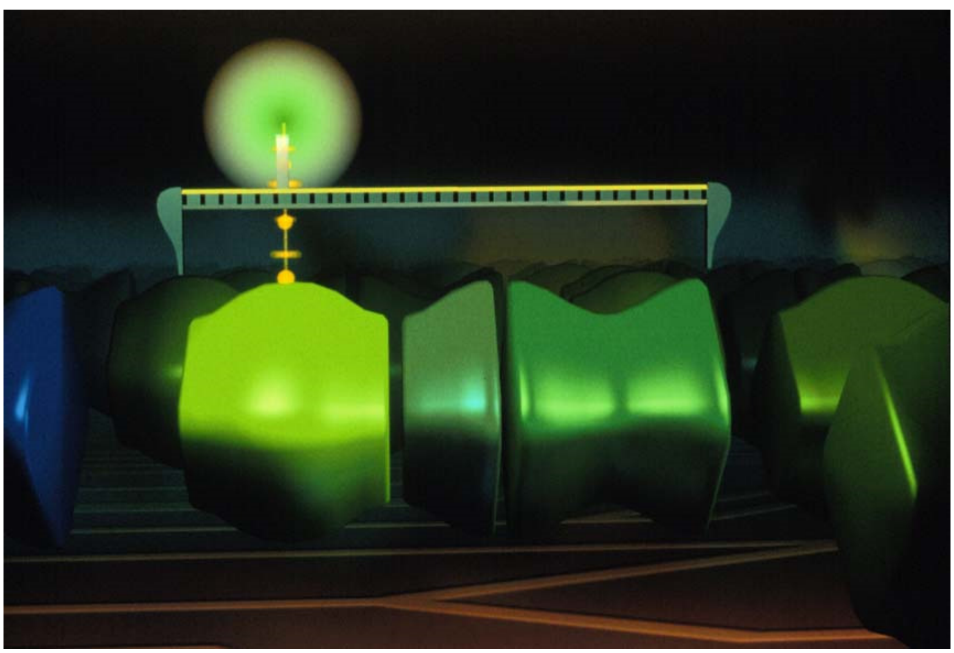


Figure 1.15 Anti-Gravity Workshop (design and animation by Thomas Hollier and Tim Wilson), *Tierra: Evolution in Another Universe* "The Ancestral Program - consists of three ``genes" (green solid objects). The CPU (green sphere) is executing code in the first gene, which causes the program to measure itself."

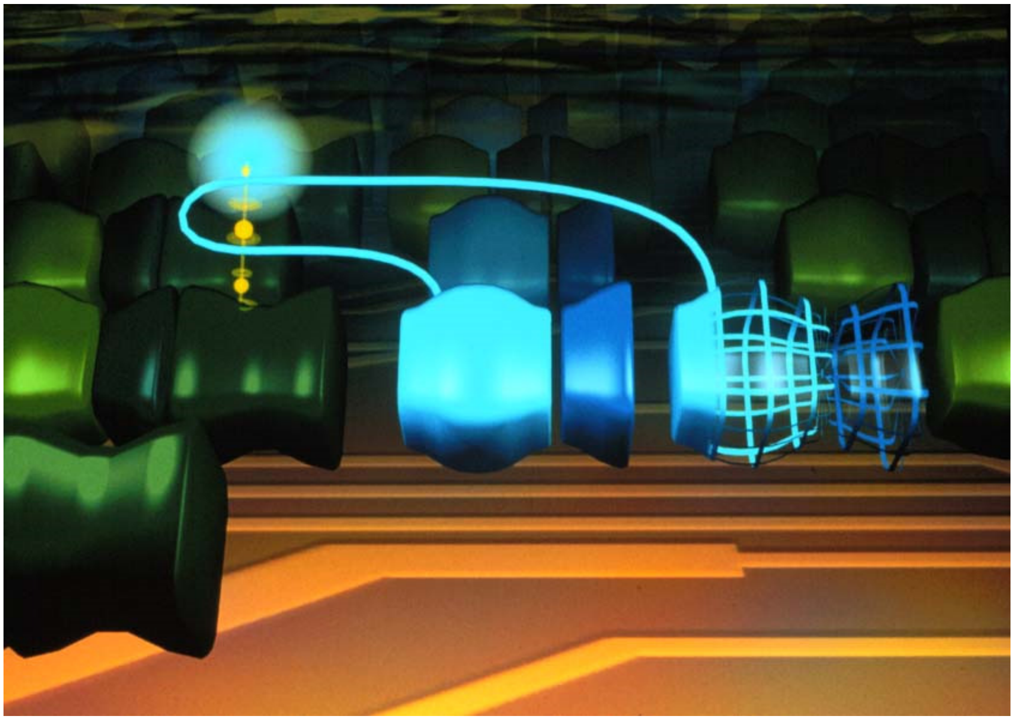


Figure 1.16 Anti-Gravity Workshop (design and animation by Thomas Hollier and Tim Wilson), *Tierra: Evolution in Another Universe* "A Parasite (blue, two piece object) uses its CPU (blue sphere) to execute the code in the third gene of a neighboring host organism (green) to replicate itself, producing daughter parasite (two-piece wire frame object)."

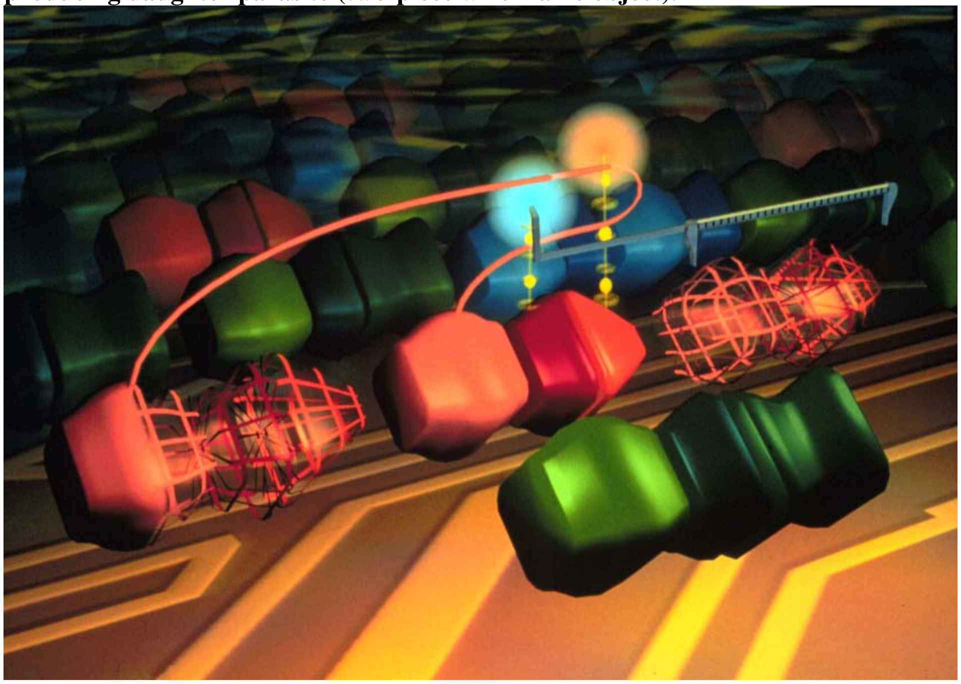


Figure 1.17 Anti-Gravity Workshop (design and animation by Thomas Hollier and Tim Wilson), *Tierra: Evolution in Another Universe* "A Hyper-parasite (red, three piece object) steals the CPU from a parasite (blue sphere). Using the stolen CPU, and its own CPU (red sphere) it is able to produce two daughters (wire frame objects on left and right) simultaneously."

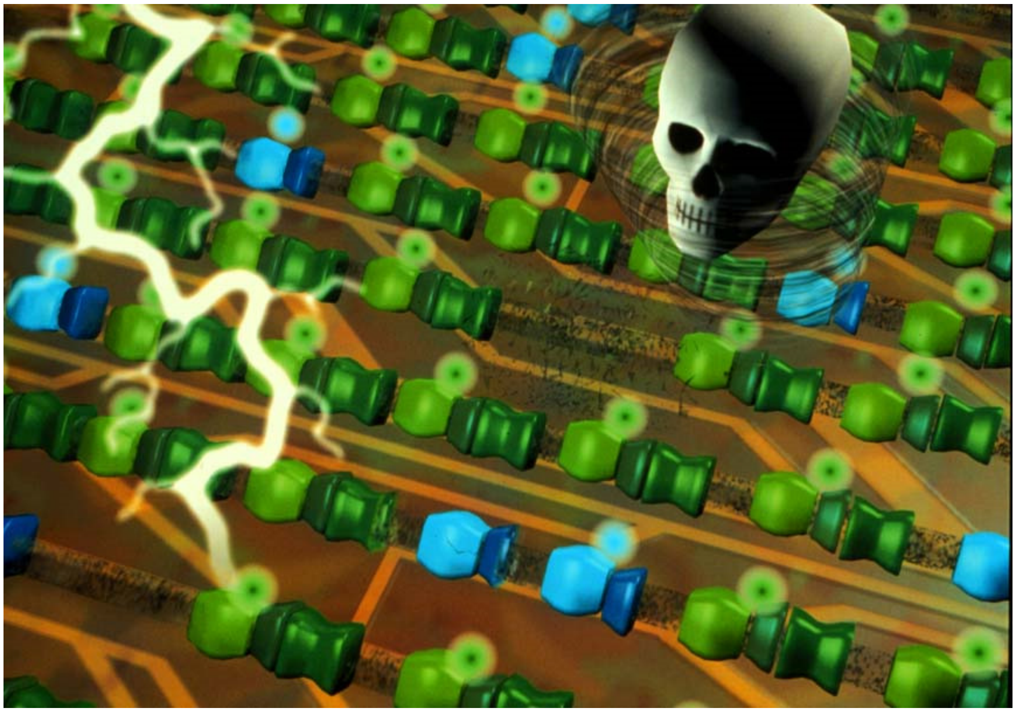


Figure 1.18 Anti-Gravity Workshop (design and animation by Thomas Hollier and Tim Wilson), *Tierra: Evolution in Another Universe.* "The Digital Environment: Self-replicating computer programs (colored geometric objects) occupy the RAM memory of the computer (orange background). Mutations (lightning) cause random changes in the code. Death (the skull) eliminates old or defective programs"

Figure 1.19 Sommere and Mignonneau, *A-Volve*, 1994-5. Visitors interacting with *A-Volve* InterCommunication Center Tokyo, Japan.

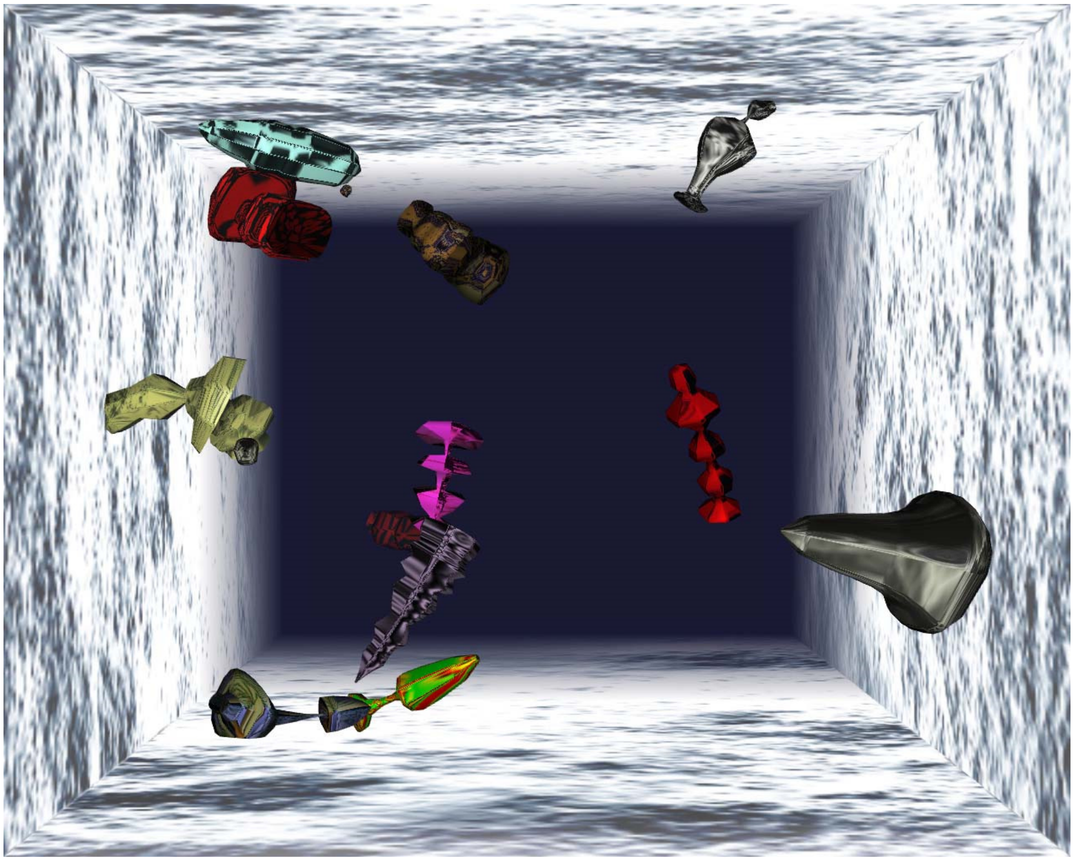


Figure 1.20 Sommerer and Mignonneau, *A-Volve*, 1994-5.

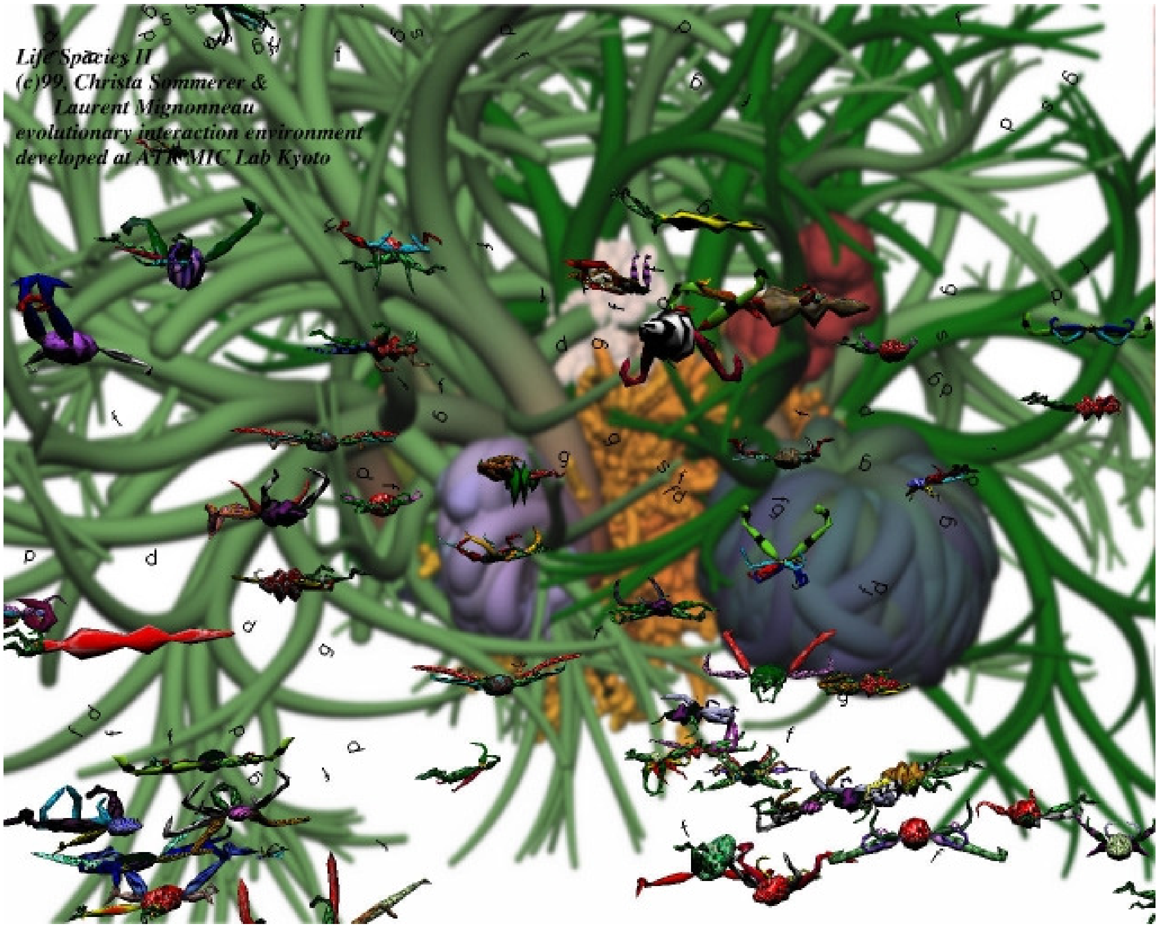


Figure 1.21Sommerer and Mignonneau, *Life Spacies II*, 1999.

Figure 1.22 Sommerer and Mignonneau, *Life Spacies II*, 1999. A viewer interacts with the project.

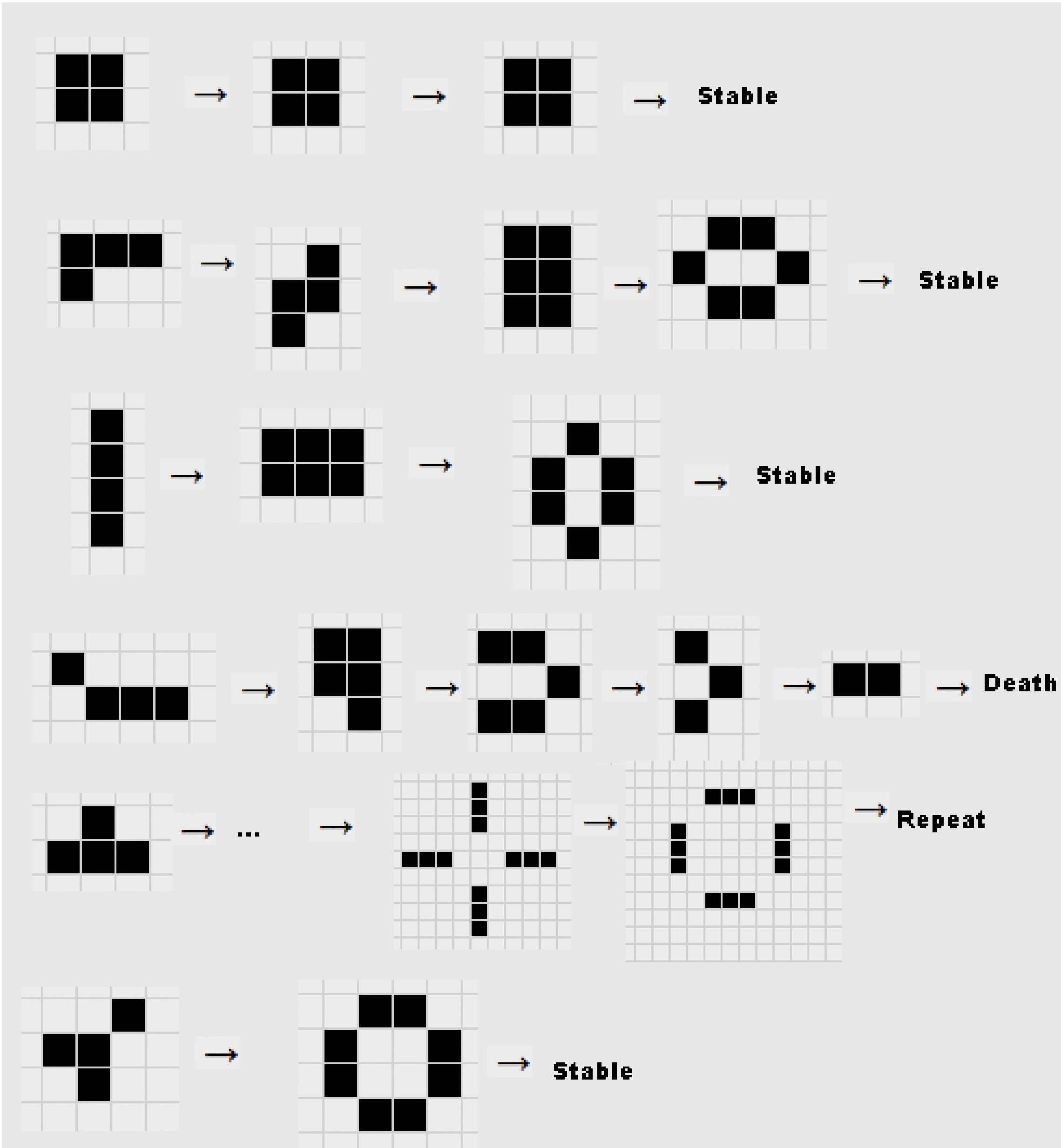


Figure 1.23 "Tetromino" forms and their progression in John Conway's *Game of Life* .
http://www.math.cornell.edu/~lipa/mec/lesson6.html

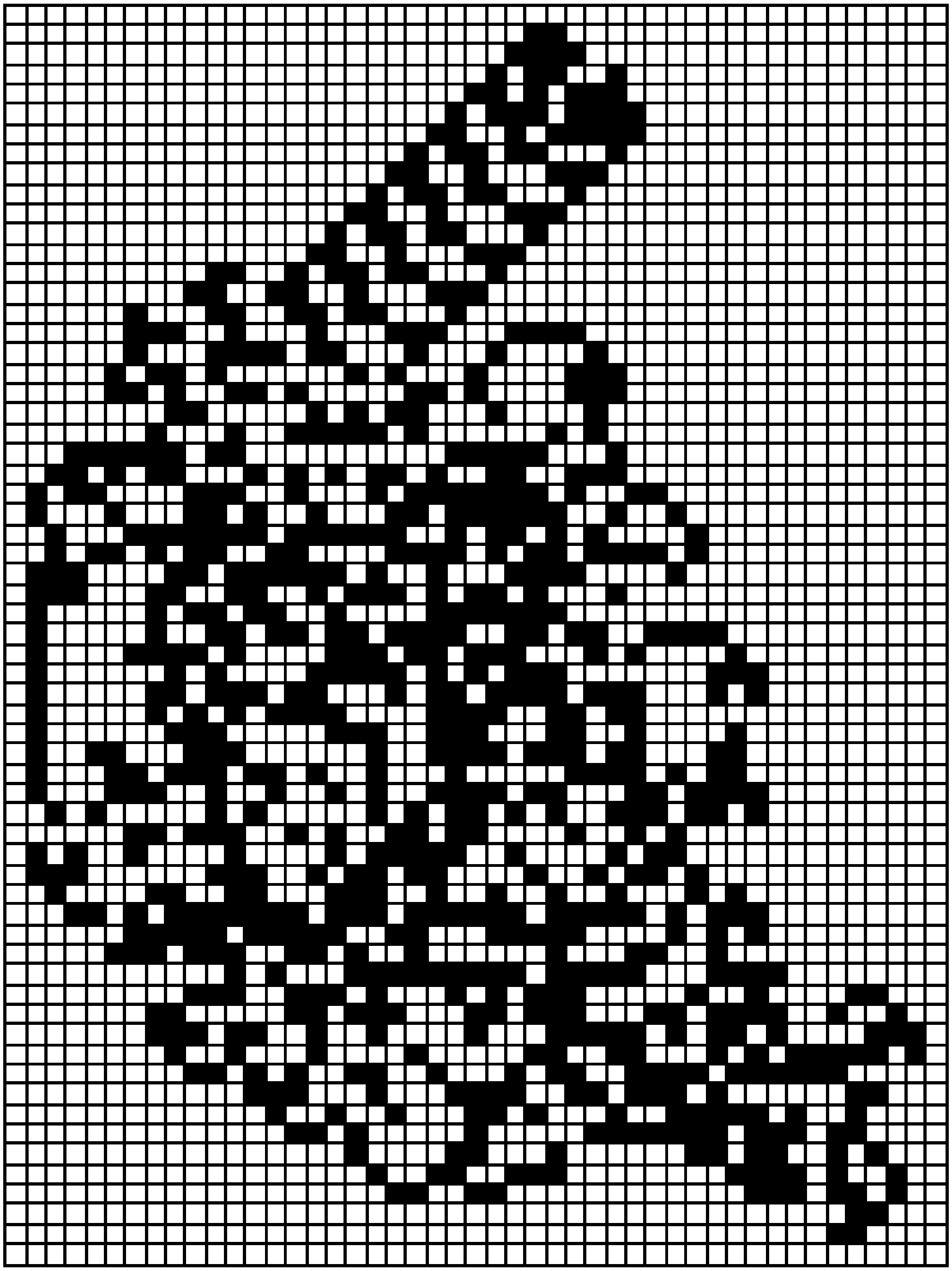


Figure 1.24 "Ant 2 building a highway at time 10,647." Scott Sutherland, "Generalized Ants," http://www.math.sunysb.edu/~scott/ants/ .

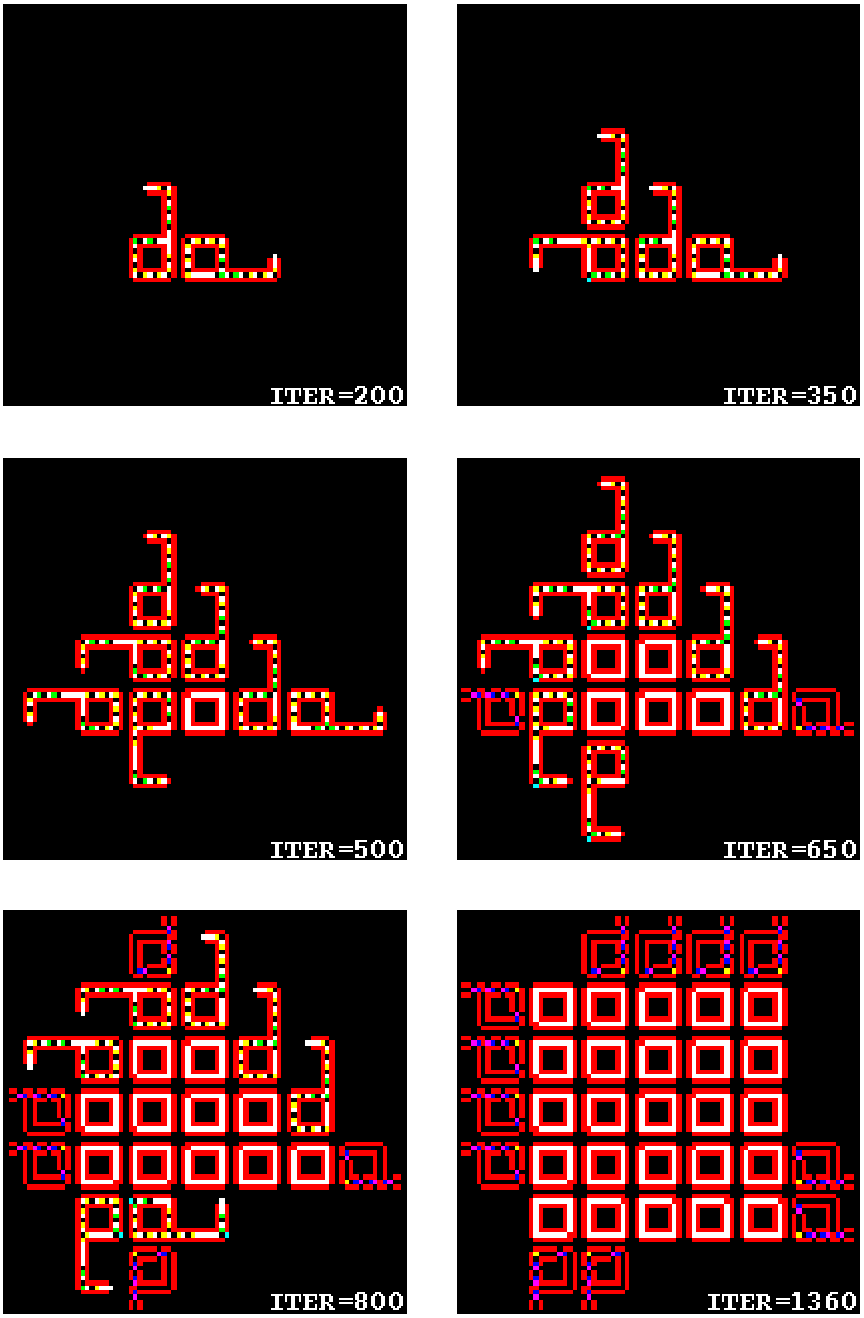


Figure 3-10: Propagation pattern of Langton's loop.

Figure 1.25 Gianluca Tempesti, "Propagation pattern of Langton's loop," from A Self-Repairing Multi-plexer Based FPGA Inspired by Biological Processes.
http://lslwww.epfl.ch/pages/embryonics/thesis/Chapter3.html

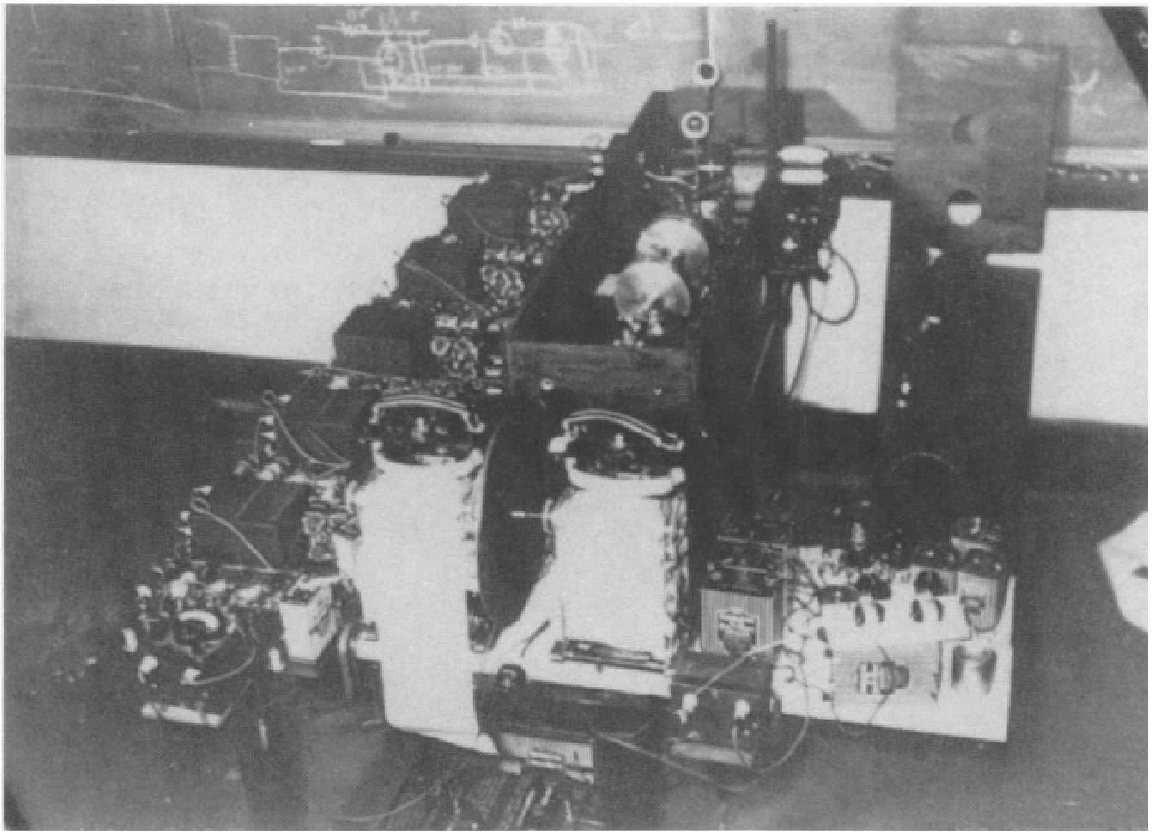


Figure 1.26 Norbert Weiner, The antiaircraft predictor. From Wiener to D. I. C. 5980 A. A. Directors, "Summary Report for Demonstration." Reprinted in Galison, "The Ontology of the Enemy," 239.

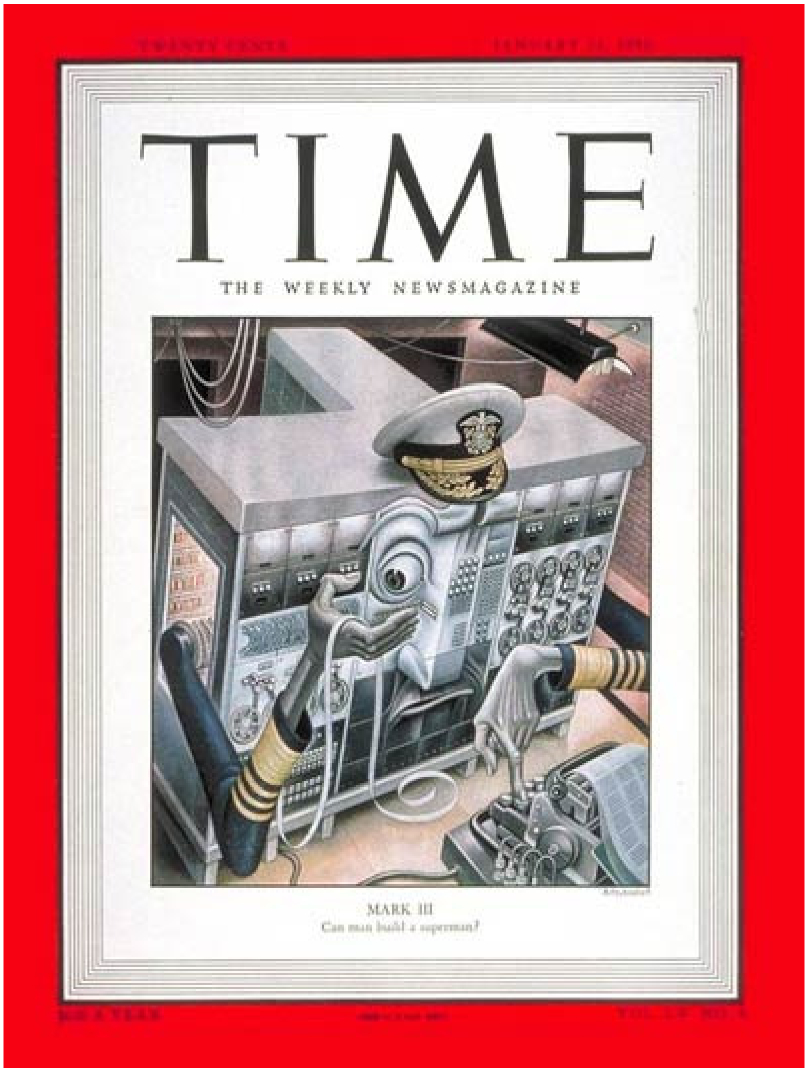


Figure 1.27 *Time* magazine cover, January 23, 1950. "Mark III: Can Man Build a Superman?" Cover credit Boris Artzybasheff.

Figure 1.28 *Time* magazine cover, February 10, 2011. "2045: The Year Man Becomes Immortal," Photo-Illustration by Phillip Toledano for Time. Prop Styling By Donnie Myers.

"This stuff moves all the time, between actual, imagined, lived, living, day dreams and other dreams, all other living things that I have planted in tissue culturing flasks in dark warm spaces."—Kira O'Reilly[187]

"But stop, stop your iron pelt of words, lest you flay us all alive, and yourself, too!"—Virginia Woolf[188]

Chapter 2 : *Skin*

Introduction

The photographs of *Omniprésence*, despite their sometimes gruesome subject matter, are arresting and entrancing: not just for their curious and at-times disturbing content, but for their luminous, glowing colors and velvety textures. In these images, captured by Vladimir Sichov, the French performance artist Orlan appears cool and collected, whether smiling for the camera in full makeup near the beginning of the performance, holding still as the surgeon traces the contours of her face, or posing with open text in front of a molded skull that supports the implants destined for insertion into her own face (fig. 1). Even in the images from midway through the surgery, where her skin is peeled back, blood soaks her hair, or a needle pierces her upper lip, she is bathed in ethereal light, her eyes bright and alert (fig. 2). She is calmly confident and in control, both presiding over the operating theater and fully present as the art object in the center of the performance.

The video of the event, however, complicates that interpretation, presenting a markedly different perspective, one of danger and drama. The tiny operating room is overcrowded, chaotic, and crackling with nervous energy. The surgeon, Dr. Marjorie

[187] Jens Hauser, *Sk-interfaces:Exploding Borders in Art, Science and Technology.* (Liverpool: Liverpool University Press, 2008), 99.
[188] *Orlando: A Biography,* (New York: Harcourt, Inc., 1

Cramer, struggles to work around cameras, monitors, and communications equipment, as well as the artist's retinue, which includes elaborately-garbed translators for English and American Sign Language. A cacophony of voices, in multiple languages, fills the room as Orlan receives and answers questions and comments arriving via fax, telephone, and live satellite connection. The colors that lend vibrancy and depth to the photographs seem garish and oppressive in the small space, emphasizing and intensifying the room's frenetic atmosphere.

The video captures the anxiety and pain the photographs largely belie, reminding the viewer of the very real danger attendant at what was, indeed, a momentous undertaking. Any surgery is fraught with risk, and the presence of extraneous persons in the operating room, let alone a patient under only local, rather than general, anesthesia, increases the danger. Although Orlan uses analgesics during and after surgery, and emphatically denies that pain plays an important role in her work, the video captures clues, some faint and some more overt, to her undeniable distress: her shallow breathing, a gasp, a glistening of the eyes, a furrowing of the brow, the ever-so-slight pulling of the eyebrow that betray the trauma she is experiencing. The face, filling the frame in inescapable close-up, is alien and alienated as the surgical tools move under and stretch the skin, yet its unmistakable humanity awakens in the viewer an immediate and visceral identification and empathy.

In addition to the hectic tumult of the operating theater itself, the video captures the act and gesture of Orlan's flaying, including the tension inherent in the decision to risk opening the skin, transgressing its boundaries, and making of the face something alien. We see, in a way difficult for the photographs—as discrete, aestheticized, completed objects—to capture, the in-betweenness that Orlan claims as her goal. The skin, as it is peeled, mask-like, away from the face, generates, as Parveen Adams has argued, a new, in-between space. Separated from its substructure, the skin becomes an indeterminate object: once a surface to the self (or itself, self), but now, something other, neither inside nor outside, before nor after, body nor object. This flaying gesture, undertaken not as punishment, but at Orlan's own will, and while she remains conscious and speaking, is a patently posthuman one. Orlan presents the body as not merely given, reflective of a single, fixed identity, but, machine-like: as openable, modifiable and even upgradeable. Yet what her opened skin reveals is not the wiring of an automaton, coldly metallic and immune to pain, but the fleshly tangle of the human body—pulled away like a mask, while the rest of her face still speaks.

I identify Orlan's project as cyborgian because of her embrace of the "impure" mingling of the organic and the machinic, in the tradition of Haraways's iconic cyborg. She emphatically refutes the notion of the body as given or inviolable, choosing instead to incorporate technology into her body in a way that neither bows to beauty norms nor hides the process. Though her rhetoric often veers toward the hyperbolic, with claims that, for example, "the body is a costume," it is countered by the inherently messy, carnal nature of her performances, in which her opened body is emphatically vulnerable and non-triumphant. Nonetheless, Orlan embodies the sort of "creative evolution" that Hardt and Negri posit as defining the posthuman; she represents not perfection but *possibility,* an early generation in the reach toward the future in which we already find ourselves living. What Orlan's project allows us to see is a physical, physiological interpretation of posthumanist ideas of mingling and exchange with organic and technological others.

This chapter laminates skin and self to think about the body as technology, modifiable, upgradable, and not limited to the state in which it was born or currently finds itself. The skin, as visible surface and ostensible border of the body, hiding the *what we do not see* of the interior body Orlan's body, is pulled back to reveal those inner workings. Her body in surgery is unfinished, in flux, replete with potential (at the hands of an empowered subject exercising complete agency), yet it also suffers, responds unpredictably to the trauma, and reveals the limits of the real, versus imagined, human body. The posthuman skin that Orlan presents to view and shapes through her rhetoric is indeterminate, unfinished, and not necessarily truthful; it blurs the borders between body and machine, male and female, self and object. Her surgical performances are difficult to watch, even creepy, but therein lies the power of this rethinking of the body. I argue that the posthuman Orlan makes visible—indeterminate, fragile, and patently embodied—provides a powerful and necessary contrast to the fantasies of technological enhancement and disembodiment that the figure can also evoke.

I begin with a description of the larger project, *The Reincarnation of Saint Orlan* (begun 1990), that contains the 1993 *Omniprésence* performance, placing it in the context of Orlan's wider oeuvre and her Carnal Art Manifesto, before proceeding to a detailed account of the *Omniprésence* video. I address the relationship between skin and self in the writings of Didier Anzieu and Michel Serres and the ways in which Orlan's performances literalize the themes they imagine, and then investigate the ways in which Orlan's flaying in *Omniprésence*, and her own rhetoric about it, is a quintessentially posthuman gesture. I argue that *Omniprésence* generates, and presents to view, a posthuman skin that draws on, but is essentially different from, former understandings of the skin and the subject it contains: a skin that cyborgically mingles flesh and technology, refuses a single given truthfulness, and is perpetually indeterminate and unfixed. I employ the skin as a metaphor to consider the liberal humanist subject and the distancing through which Kant defines the aesthetic—and in turn, as Terry Eagleton proposes, liberal humanist subjecthood itself. Against that framework, and this subject's treatment of his racial and non-human others, I introduce Oron Catts and Ionat Zurr's "semi-living sculpture" *Victimless Leather* to explore further the webs of meaning between self and skin, human and other, and to highlight the unique potency of Orlan's performances. I conclude by returning to the themes of empathy that make Orlan's project so powerful for imagining the posthuman, despite, and even because of, the failure that inheres in the projects—from Orlan's "failure" to resemble the plan she initially established for the project, to the monstrous growth that forced *Victimless Leather*'s MoMA exhibitors to "kill" it.

Carnal Art

Carnal Art is the label Orlan applies to her surgical performances, which began in 1990 with the announcement of her upcoming project *The Reincarnation of Saint Orlan* (fig. 3). Her Carnal Art Manifesto (see Appendix I) outlines what this particular style of body and performance art involves, and what it stringently refutes. From its first sentence, which defines Carnal Art as "self-portraiture in the classical sense, but realized through the possibility of technology," through its concluding statements on style, in which Orlan professes a love for the baroque against the formalist and conformist, she reveals her indebtedness to, but independence from, Western art historical traditions. In succinct sections with the subheadings Definition, Distinction, Atheism, Perception, Freedom, Clarification, and Style, Orlan describes Carnal Art as concerned with the process of surgery and the body as medium, and as specifically *not* interested in pain, which she connects not only with Body Art, but a Christian tradition that denies "body-pleasure," and prescribes pain, as in childbirth. Carnal Art is in many ways a continuation of Orlan's more traditional earlier oeuvre, a coherence she deliberately highlights in her lectures and presentations, and one which does provide a useful framework from which to understand the more esoteric surgical works.

Among her earliest works are black and white, nude self-portraits Orlan began producing when she was 17. In them, she uses masks and contorted poses to subvert the idea of the classical nude, presenting instead a lithe, young body in ways that are far more evocative of the monstrous than the seductive. The first of these images,[189] the 1964 *Orlan accouche d'elle-m'aime* (Orlan Gives Birth to Her Loved Self), seems particularly prescient in retrospect (fig. 4). In it, Orlan, seen from above and reclining slightly, supports her head with one hand and with the other caresses the armless and androgynous mannequin resting between her knees, to whom she seems to give birth. This gesture of symbolic autopoesis follows another recreation of self, a few years earlier: her adoption of the name Orlan.[190] Both prefigure the "reincarnation" that would follow in Carnal Art.

Orlan's work throughout the '60s and '70s continued to focus on resistance to power, institutions, and expectations, centering particularly on her use of sheets from her trousseau. These sheets formed the canvases for embroidery-highlighted semen stains obtained from gallery owner "donors"; the discarded drapery of a saint-cum-Venus in a

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[189] Cros, Caroline, Laurent Le Bon, & Vivian Rehberg. "Chronophotoglogy," in *Orlan*, trans. Deke Dusinberre (Paris: Flammarion, 2004), 9.
[190] Kate Ince, *Orlan: Millenial Female.* (Oxford: Berg Publishers, 2000), 1. Ince also recounts an incident in which Orlan, paying by check in her analyst's office, noticed, along with her therapist, that in her signature, the word *Morte* stood out from her full name (Mireille Suzanne Francette Port).

sequentially photographed striptease; and the garment in which she performed her *MesuRage* actions, measuring traditionally male-dominated spaces in "Orlan-corps," or her own body-lengths (fig. 5). In 1977, Orlan was dismissed from her teaching post at the Atelier de Trois Soleils after a public performance of *Le Baiser de l'artiste*, in which viewers who dropped a coin into a slot on Orlan's breastplate—featuring a photograph of her nude torso, and with a coin collection receptacle at her crotch—received a kiss from the artist herself (fig. 6). [191]Beside her on the podium, in striking counterpoint, stood another photographic cut-out of herself, this time swathed in voluminous fabric as Sainte Orlan (fig. 7). [192] In the late '70s and '80s, Orlan's performance and photography series *Le Drapé-le Baroque* again starred this baroque persona of the Madonna or White Virgin (fig. 8), and color photographs from the '80s and '90s show variations on the theme, including *Madonna of the Garage* (where her apotheosis is effected via hydraulic lift) (fig. 9).

The series of color photographs *Peau d'âne* (Donkey Skin) was produced in 1990, the same year Orlan announced and began the *Reincarnation* series, and addresses similar themes. In these vivid, highly-saturated photographs (fig. 10), Orlan, set against vibrant backgrounds that seem to surround her with a glowing aura, poses in fanciful headgear, from a pair of donkey's ears to a bishop's miter. In some images she wears elaborate

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[191] Orlan, "Body and Action," in *Orlan: 1964-2001.* (Salamanca: Flammarion, 2002), 208.

[192] In an interview with Acne Paper, Orlan described the inspiration for the piece as follows: "'Sainte Orlan' came from a character that I created for 'Le baiser de l'artiste' from a text called Facing a society of mothers and merchants.' The first line of this text was: "At the bottom of the cross were two women, Maria and Maria Magdalena." These are two inevitable stereotypes of women that are hard to avoid: the mother and the prostitute. In 'Le baiser de l'artiste' there were two faces. One was Saint Orlan, a cutout picture of me dressed as Madonna glued onto wood. One could buy a five francs church candle and I was sitting on the other side behind the mock-up of the vending machine. One could buy a French kiss from me for the same amount of money one could buy a candle. The idea was to play on the ambivalence of the woman figure and the desire of both men and women towards those biblical and social stereotypes. Being showcased in the Paris International Contemporary Art Fair, the artwork was somehow both an installation and a performance." Oleg Mitrofanov, "Devotion Orlan" in *Acne Paper* 9 (Winter 2010), 34.

costumes, mismatched with her equally extravagant headgear, and in others she is topless. Her poses and facial expressions range from coquettish to silly, and don't seem to correspond to either her costume or state of (un)dress. As scholar C. Jill O'Bryan points out, the title *Peau d'âne* refers to a French fairytale by Charles Perrault.[193] Orlan's images seem lighthearted and frivolous, doubtlessly influenced by the 1970 musical film adaptation of the tale (fig. 11), with its ornate costumes (including a gauzy ruff worn by the Lilac Fairy, the princess's godmother), sparkles, and bright, stylized colors.[194] The story itself, however, has, as do so many fairytales, rather dark undercurrents. When her queen mother dies and her father the king (having promised the queen to re-marry only a woman more beautiful than herself) decides that the princess is the only suitable replacement as his bride, the princess delays by requesting a sequence of increasingly-elaborate nuptial gifts: a gown the color of the weather, of the moon, of the sun. Finally she requests, and is granted, the skin of her father's prized donkey, which defecates riches and is the source of the court's wealth. Disguising herself in the beast's flayed skin, and with dirt carefully applied to her skin by the Lilac Fairy, the princess is able to escape the castle and her father's incestuous advances. In a nearby kingdom, she is forced to take dirty jobs and is persecuted for her ugliness and smelliness. The prince, however, stumbles upon her in her forest hovel, where she is wearing her radiant sun-colored gown, and immediately falls in love. Through the usual fairytale avenues, they are united, married, and live happily ever after.[195]

As O'Bryan points out, Orlan's *Peau d'âne* "mirrors a few motifs articulated in La Reincarnation de Sainte-Orlan: beauty and ugliness; and the idea that molding one's own

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[193] C. Jill O'Bryan, *Carnal Art: Orlan's Refacing* (Minneapolis: University of Minnesota Press, 2005), 9.
[194] *Peau d'âne*, directed by Jacques Demme (1970; Marianne Productions).
[195] Even the king, who marries the Lilac Fairy.

skin means shaping one's destiny."[196] Although the skin of the flayed donkey allows the princess to escape the palace, the guise renders her monstrous. Villagers speculate that her skin hides some foul disease, that she is evil, and that she infests the air. The prince insists to a friend that he wants to marry Donkey Skin because she "is a beauty," though the friend warns that others will think him mad. Yet, when the prince and princess meet again and it is revealed that she is the one he loves, her outer skin (and presumably with it any offensive miasma) falls away and she is resplendent again in her sun-colored gown. The donkey's skin defined her while she wore it, but her ability to shed it and reclaim her all-important beauty is what matters in the end. Orlan plays with costumes to upend the idea of beauty in *Peau d'âne*, mismatching the fine textiles, juxtaposing the ornate hats with her nude torso, and, despite her carefully applied cosmetics, mussing her hair and making foolish faces. This questioning of beauty norms would also form a key element in the *Reincarnation* series, along with the idea that changing the skin can change the self.

Orlan's shift to the medium of surgery with Carnal Art, and the deliberate parallels she draws to earlier work, not only in her discussions of her oeuvre, but in the artifacts that she displays in the operating room (such as a life-sized cutout of herself as the nude Venus from *Strip-tease occasionnel* or a black and white photograph of herself as Saint Orlan), draw connections between her body and the other media she has used in her art. Her own skin becomes the costume: the mismatched fabrics that stand in for a semi-magical donkey skin, or the voluminous wrappings that, as in *Le Drapé-le Baroque*, are stripped away to reveal a different self altogether. To take as an artistic medium one's skin, however, has far higher stakes, physically and culturally, than any other material

[196] O'Bryan, *Carnal Art*, 9.

with which she has worked. By opening the body, she continues, more emphatically than ever, her rebellion against institutions that would declare the body as sacred and untouchable space, and uses Carnal Art to show what the body can mean with the use of current technology.

The *Reincarnation of Saint Orlan*

Omniprésence was the seventh, and most ambitious, of the nine surgeries that comprise the series *The Reincarnation of Saint Orlan*. The series began, according O'Bryan, "on May 30, 1990, Orlan's forty-third birthday, when she exhibited *Imaginary Generic: Successful Operations* at the Newcastle Festival in All Saints' Church, Newcastle, England."[197] The ambiguity in the image permeates and is reflective of the *Reincarnation* project as a whole. Although it looks like a movie poster, it is actually a painting, done in acrylic on canvas. It was painted not by Orlan, but by the ad agency Publidécor, with whom Orlan collaborated on her 1988 series *Les Affiches Peintes* (Painted Posters). The poster is complete with credits: directing by Orlan, screenplay by Serge Grümberg, lighting by Jean-Michel Ribettes, and production by "Sept et Demi." An "avec" section suggests appearances by "Marina Abramovic, Jean-Michel Pheline, Jean Dupuy, Helene et Ben Patterson, Elisabeth Jappe, Joel Savary, Ramon Tio Bellido, et Litz [sic] Taylor." Although her project is an extremely collaborative one (surgery necessitating a skilled surgeon, among others), the names listed on the poster are not her project collaborators but "friends and well-known figures from the world of art and movies."[198] Finally, although the image seems to lay out a clear schematic for a program of appropriation, Orlan claims that she is not literally appropriating the features of the

[197] O'Bryan, *Carnal Art,* 14.
[198] Caroline Cros ,et al, "Chronophotology," in *Orlan*, trans Deke Dusinberre (Paris: Flammarion, 2004), 101.

Western art historical beauties shown. Her own goal, she insists, is not a unified, beautiful gestalt, nor has she chosen these characters only for their beauty.

At the center of the image, Orlan, her features blended with those of the art historical beauties surrounding her, rests her chin in her hands. Her hair frames her face in loose waves and she demurely averts her eyes in a classic modeling pose. Portraits of Western art historical beauties ring her in a halo of sorts, each marked by a transparent red box that highlights a particular facial feature and links it, by a sharp red arrow, to the corresponding part of Orlan's face. Some of these are readily identifiable, perhaps most so Botticelli's Venus (with highlighted chin) and Leonardo da Vinci's Mona Lisa (with highlighted forehead). Between those two is Francois Pascal Simon Gérard's Psyche, with highlighted nose, and to the right of them, with highlighted eyes, the somewhat less well-known Diana the Huntress by an anonymous School of Fontainebleu artist. At the far right is a figure that Orlan identifies as Europa, though the source image is far less clear.[199]

Although it is the physical features of the women surrounding her that Orlan highlights and merges with her own in the poster (fig. 12), she states that she has chosen them not simply for their beauty, but for their underlying symbolism and the "inspiration" present in their histories.[200] She explains:

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[199] In one of the earliest American pieces written on Orlan's work, art historian Barbara Rose identified the Europa artist as Boucher, who did paint three versions of the abduction of Europa. (Barbara Rose, "Is It Art? Orlan and the Transgressive Act," in *Art in America* 81:2 (February 1993), 83-125) O'Bryan attributes the figure to Gustave Moreau, who painted watercolor and oil versions of the Europa scene, though neither is particularly close to the image in the poster. (O'Bryan also refers to the image of Diana as a sculpture.) The closest match my research has revealed is to a tapestry, based on Boucher's 1747 oil painting (in mirror-image, as is typical), executed in the workshop of André-Charlemagne Charron. However, even this is far from definitive. (See Figure 12.)

[200] "These representations of feminine personages have served as inspiration to me and are there deep beneath my work in a symbolic manner. In this way, their images can resurface in works that I produce,

> Diana was chosen because she is insubordinate to gods and men; because she is active, even aggressive, because she leads a group. Mona Lisa, a beacon character in the history of art, was chosen as a reference point because she is not beautiful according to present standards of beauty, because there is some "man" under this woman. We now know it to be the self-portrait of Leonardo Da Vinci that hides under that of La Gioconda (which brings us back to an identity problem). Psyche because she is the antipode of Diana, invoking all that is fragile and vulnerable in us. Venus for embodying carnal beauty, just as Psyche embodies the beauty of the soul. Europa because she is swept away by adventure and looks toward the horizon.[201]

The focus on the inspirational traits of these women, rather than primarily their physical ones, again emphasizes that Orlan is not literally appropriating those features. She uses cosmetic surgery, not in the pursuit of beauty or even a unified gestalt, but to foreground and question the beauty norms and pressures to which women are consistently subjected.

The first surgery in the series, *Art Charnel* (Carnal Art), took place shortly after the presentation of *Imaginary Generic*, in July of 1990 in Paris, and involved liposuction of the face and thighs; the fat was sealed into limb-shaped reliquaries.[202] In one photograph of the performance (fig. 13), Orlan reclines on the operating table, her head and torso swathed in green surgical drapes. Electrodes, monitors, wires and tubing cover her bared breasts and arms, though her right arm bends at the elbow to raise a copy of Eugénie Lemoine-Luccioni's *La Robe* to reading height. Behind her, the aseptic tiled wall and operating room equipment are set off by a life-sized cut-out of Orlan in the pose of Botticelli's Venus, a photograph from her series *Incidental Strip-Tease Using Sheets from the Trousseau* (1974-1975). The surgeon and his assistant wear costumes of red, gold, and black, striped with reflective piping that glows in the camera's flash. Orlan's lips

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with regard to their histories." Orlan, "Orlan's Speech" in *Orlan: 1964-2001.* (Salamanca: Ediciones Universidad de Salamanca, 2002), 220 .

[201] Orlan, "Intervention" in *The Ends of Performance*, ed. Peggy Phelan & Jill Lane, (New York: New York University Press, 1998), 319-20.

[202] O'Bryan, *Carnal Art,* 14.

move as she reads aloud from the text, even as the surgeon directs the cannula through her skin, the attached tube already filling with a thick pinkish substance.

Text consistently forms an important part of Orlan's surgical performances, and *La Robe* (Dress), subtitled Psychoanalytic Essays on Clothing (1983), has become a crucial text for her. The final chapter of the book takes as its subject the artist herself, which is how Orlan first came to read it. Lemoine-Luccioni focuses, briefly, on Orlan's series *Les Draps du Trousseau* and *Le Drapé-le Baroque*, and briefly mentions her *S'habbiler de sa proper nudité* (*Dressed in Her Own Nudity*, in which Orlan wore a dress printed with an image of her own naked body). In both Orlan's artwork (her appropriation of Bernini's Saint Teresa, for example, or Ingres's Grand Odalisque) (fig. 14) and in her personal life, Lemoine-Luccioni reads disguises, or *travestie* (a word that in French also refers to transvestism or cross dressing). She traces this desire for self-reinvention to Orlan's relationship with her distant, absent mother, whom Orlan also accuses of "wanting, as all mothers do, to sell her off."[203] Lemoine-Luccioni calls Orlan's a double disguising: as a teenager, dressed/disguised as a man to not be like her mother, and, having become a woman, dressed/disguised as a woman, with even her excessively feminine attributes (bared breasts, exposed sex) a mask (fig. 15).[204]

However, it was a passage in an earlier chapter, "The Second Skin," with which Orlan credits her inspiration to use surgery to physically change her own skin. Lemoine-Luccioni writes:

> Skin is deceiving. ...in life, one only has one's skin... there is a bad exchange in human relations because one never is what one has... I have the skin of an angel, but I am a jackal... the skin of a crocodile, but I am a

[203] Eugénie Lemoine-Luccioni, *La Robe: Essai psychanalytique sur le vêtement* (Paris: Aubier, 1983), 142. Unless otherwise noted, translations are mine.
[204] Ibid. *1*40.

> puppy, the skin of a black person, but I am white, the skin of a woman, but I am a man; I never have the skin of what I am. There is no exception to the rule because I am never what I have.[205]

As Orlan describes it, “Reading this text, I thought that in our time we have begun to have the means of closing this gap; in particular with the help of surgery... that it was thus becoming possible to match up the internal image with the external one.”[206] Orlan reads this seminal text, to which I will return, during all of her surgical performances.

The second and third surgical performances were somewhat smaller productions, according to O’Bryan, due to the “increasingly problematic” surgeon, Dr. Chérif Kamel Zaar, who “protested the excessive décor and documentary equipment” of the first surgery, allowed only one photographer for the second, and insisted on general, rather than local, anesthesia for the third. The second surgery involved the insertion of a prosthesis to evoke Venus’s chin, and the third surgery “liposuction of the legs and ankles, and retouches to the face and eyelids.”[207]

The fourth surgical performance, *Opération réussie* (Successful Operation/ Surgery), occurred in December of 1991 and featured a new surgeon, Dr. Bernard Cormette de Saint-Cyr. This performance was the glitziest to date, with Orlan, the surgeon, and his attendant in gowns with iridescent metallic spangles, designed by Spanish fashion designer Paco Rabanne. The Venus cut-out was again present, as was another painted movie poster, this one featuring imagery from *Art Charnel*, and a long banner reading “jamais film aussi abject n'avait sonné aussi pur” (film never sounded as abject as pure). Other props included a large image from *Etude documentaire: le Drapé-le Baroque*

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[205] Ibid, 95; quoted and translated into English in Orlan, “Conference.”
[206] Orlan, “Conference” in *Orlan: Cecí est mon corps… Cecí est mon logiciel* (London: Black Dog Publishing Limited, 1996), 88.
[207] O’Bryan, *Carnal Art*, 15.

1979-1980, decorative urns with real and plastic fruit and lobsters, the black and white crosses from *Orlan's Skaï and Sky e Vidéo* photographs (1983), a loaf of bread, a silver microphone, and a pair of flashy sunglasses (fig. 16).

In an edited video of the performance, operating room footage is set against an insistent electronic soundtrack.[208] A white cross divides the screen, and the resulting corners are alternately clear and overlaid with another video. Orlan, in her spangled gown, tears plastic sheeting from the wall, strikes poses with a cross in each hand, and seductively eats grapes off the bunch. In scenes reminiscent of her earlier *Le Baiser de L'artiste* (The Artist's Kiss, 1977), she enthusiastically kisses Stefan Oriach and the bespectacled surgeon, who grins as they part. The camera cuts from Orlan reading *La Robe* to a close-up of her flesh, swabbed with an orangish antiseptic. Moments later we see her reclining on her side on the operating table, still reading aloud from the book, as the surgeon inserts the liposuction cannula into the flesh of her back. He makes a few preliminary strokes, then begins rapidly sawing back and forth as she continues to read.

In a typically humorous, if nonetheless somewhat disturbing, image of the performance whimsically entitled "Warranted Pure ORLAN no artificial color added," Orlan lies on her side on the operating table, one leg bent under her and the other extending into space (fig. 17). One arm props her up, and the other holds a suction canister filled with what one can only assume is the fat that has just been removed during the procedure. The smooth, pale skin of her face and arms contrasts with the bright red, "pure" Orlan in the canister, the clear walls of which suggest a transparent body that her own flesh belies. Orlan preserves the fat removed in these procedures into "reliquaries,"

[208] *'…In a short time, you will no longer see me… and then a short time later… you will see me again…'* or *SUCCESSFUL OPERATION Nº X*, from the CD-ROM included with *This is my Body… This is my Software* (London: Black Dog Publishing, 1994).

echoing—and subverting—the Christian tradition that carefully preserves and venerates fragments of saints and holy objects. The "purity" suggested by the title would seem to be a requirement for such an object of veneration, yet the canister reveals neither pure fat nor pure blood, but a fleshy mixture of the two: an indeterminate inside brought outside, and vested with the significance of representing the artist herself.

The fifth surgery performance, in July of 1991, was officially dubbed *Opera Operation* and was again carried out by Dr. Zaar. This performance was yet more elaborate than the last, with its visual centerpiece the elaborate gown designed by the Parisian fashion house Franck Sorbier and a coordinating brightly-colored, harlequin-patterned cap (fig. 17). The gown featured a black bustier bodice giving way to a full, silky skirt elaborately patterned in bright red, yellow, blue, purple, and orange forms: abstracted anthropomorphic figures, musical notes, stars and moons. Orlan's hair (red on one side, blue on the other); her cherry-red gloves; and props including a pitchfork and red-eyed, red-horned plastic skull, intensified what Cros describes as a "carnivalesque atmosphere," one further emphasized by the presence of dancer Jimmy Blanche, who, she writes, performed a strip-tease during the surgery.[209]

The structuring text for the performance was "Secularism," the introduction to philosopher Michel Serres' 1991 *Le Tiers-Instruit* (The Troubadour of Knowledge), which recounts the fantastical tale of Harlequin, the Emperor of the Moon, who, upon returning from visiting the far reaches of his realm, haughtily reports to his subjects that "everywhere everything is just as it is here."[210] From the disappointed crowd, one individual rises to challenge the emperor, asking whether they are also to believe that his

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[209] Cros, "Chronophotology," 126.
[210] Michel Serres, *The Troubadour of Knowledge*, trans. Sheila Faria Glaser with William Paulson (Ann Arbor: University of Michigan Press, 1997), xiii.

cape is the same in every part—“a road map of your travels?” The discomfited emperor struggles out of his harlequin-patterned cloak—a patchwork, indistinct and chimeric—only to reveal more and more layers of shimmering, iridescent, layers of motley. Peeling off layer after layer of clothing, he finally gets to the skin underneath: also tattooed, patchworked, incoherent, and revealing the emperor himself as a hermaphrodite, a monstrous mixture in a single body. “What can the common monster,” Serres writes, “tattooed ambidextrous, hermaphrodite and cross-bred, show to us right now under his skin? Yes, Blood and Flesh.”[211] This text, in a multitude of different languages, adorns the series of *Grands reliquaires* (Large Reliquaries) that enclose 10 grams each of Orlan’s resin-preserved flesh, sealed in metal frames behind bullet-proof glass (fig. 18). Yet Serres’ story continues: the emperor is transformed into what the audience identifies as another commedia dell’arte character—Pierrot, glowing whitely as his many colors integrate. The emperor has been marked by his travels, and his experiences, gained knowledge, and adopted customs are engraved upon his clothing as well as his skin. He displays, as the learned subjects explain, “the secular miracle of tolerance, of benevolent neutrality” that can define a society that recognizes and accepts the monstrous mixture that is humanity.

During the performance Orlan’s own skin is marked, in a sort of temporary tattoo: curved lines and hatching on her legs, thighs, and buttocks, where the liposuction is to take place, and war-paint-like lines on her face marking nasolabial folds, cheekbones, upper lip, and nose. Her colorful skirt hiked up, anesthetic injections and the liposuction cannula trace these lines, even as she continues calmly to read. The dancing harlequin on the cover of Serres’s book—held in Orlan’s red-gloved hands with a pen at the ready, as

[211] Ibid, xvi.

if to take notes—matches her own cap. Even when the needle enters her face, she continues reading, the camera's extreme close-up capturing her carefully rouged lips moving even as her cheek is pierced.

The sixth surgery was, to judge from the few photographs available, a more subdued affair,[212] with Orlan in a shiny black jacket and a fur hat (fig. 19). O'Bryan and art historian Sarah Wilson write that the performance involved "liposuction from the face and belly," and two images—one showing Orlan's swollen, taped face, and another showing her printing a kiss on a transparent sheet, as she did in 1991's *Opération Réussie*—support this.[213]

Omniprésence

The *Reincarnation of Saint Orlan* reached its peak in November of 1993 with the seventh surgery performance, *Omniprésence*, the largest and most ambitious to date (fig. 21). Held in New York City, it was intended to insert cheekbone and forehead implants,[214] and to be broadcast live to museums and galleries around the world. Clocks on the wall of the operating theater, labeled Paris, New York, Tokyo, and Toronto, indicated the project's global scope, with live links to various museums and galleries across the world, including the Sandra Gering Gallery in New York City, the Centre Georges Pompidou in Paris, and the Creative Institute in Riga, Latvia. Viewers could ask questions and make comments via phone, fax, and videophone. The performance

[212] I have been unable to determine why this surgery was less documented than the others.
[213] O'Bryan, 16, and Sarah Wilson, "L'histoire d'O, Sacred and Profane," in *Orlan: Cecí est mon corps… Cecí est mon logiciel* (London: Black Dog Publishing Limited, 1996), 15.
[214] O'Bryan writes that a chin implant was to be part of the surgery as well (19), but it seems doubtful that this was the case, as, according to O'Bryan, a chin prosthesis was inserted in the second surgery.

included two translators, one between French and English, and one for American Sign Language.

As in earlier performances in the series, the operating room has been turned into a colorful (and crowded) theater. Chartreuse fabric covers the walls and floor, matching surgeon Marjorie Cramer's cap, gown, and mask, as well as the hat of the sign language interpreter. Others present in the operating room wear black gowns emblazoned with the phrase "the body is but a costume." Unlike earlier performances, there are no colorful props, photographic cut-outs, or painted posters. Instead the small space is filled with a jumble of communications technology and their associated operators—video cameras, videophone, monitors, fax machine, and the old-fashioned corded phone Orlan is handed as the video of the performance begins. Orlan looks more polished than theatrical, in a dark, conservative dress with short sleeves, a scooped neck, and a waist-defining corset. Her hair, parted down the middle, is bleached blond on the left and dyed a vivid indigo on the right, and her manicured nails match the red of her lipstick. She smiles as she accepts the phone, a call from Sandra Gering, and although she jokes in her heavily-accented English about wanting champagne, the undercurrent of nervous tension is palpable in the speed of her speech and the hubbub of other voices in the room.

The two translators join Orlan in the operating room as she prepares to read the opening text (fig. 22). The room falls silent as she reads, in French, the aforementioned passage from *La Robe*: "Skin is deceiving…" Orlan's voice is rich and clear, the translator's movements graceful, and the combined effect highly theatrical. At the conclusion of the passage, Orlan closes the book and states, in French, that she uses this text for all her operations because she "believes strongly that it is possible to reduce the distance between that which one has and that which one is."

Orlan seats herself on the operating table and begins taking questions by fax as a surgical assistant removes her make up. As the questions and comments continue to come in, Kramer begins to marks Orlan's skin, deftly manipulating the underlying bone and muscle and tracing contours with her pen: dots under the eyes, lines indicating the nasolabial folds and cheekbones, hatches above the eyebrows, brackets alongside the nose, a tracing of the jawline (fig. 23). Through Kramer's probing fingers and pen, Orlan's face is transformed into sculptural material in the hands of an expert, and the skin itself into map of its own approaching transformation. Kramer carefully positions blue silicone implants over Orlan's cheekbones and temples and traces around each one. Afterward she places the implants on a skull at the foot of the operating table, but the adhesive doesn't hold, so Orlan keeps the inserts in place with manicured fingers, her hands cradling the whimsical *memento mori* like a child's head (fig. 24). The smooth blue implants on the creamy plastic of the skull suggest an easy integration between the technology of these prostheses and Orlan's own body, although the difficulty of attaching them foreshadows the messy technical details in modifying the body. Both skull and implants belie the flesh that comprises the body, the in-between stuff of skin and fat and blood.

Tension continues to run high in the operating room as Cramer and her assistants prepare for surgery, technicians establish remote connections, and questions continue to come in by fax and videophone. Cramer places a bright yellow surgical drape behind Orlan on the table and has her recline so that the IV needle can be inserted and taped to the back of her hand. Orlan is helped into a black gown with attached black gloves, for which she requests the black belt designed to accompany it. Flat on her back and with Cramer leaning over her to swab her neck and face, Orlan appears tense as she strains to look to her right, toward the questions to which she responds. Cramer lifts Orlan's head, repositioning it in a more natural position as she pens in more lines, in front of Orlan's ear and through her hair. As Cramer uses tweezers to tuck cotton into the opening of Orlan's ear, they converse briefly in a mélange of French, English, and gestures; Cramer seems to explain that she cannot access Orlan's temple without making a longer cut that goes in front of the ear, and Orlan nods in assent. Over the continuing babble of voices in the room, we hear Cramer tensely demand local anaesthetic, and for a moment the camera pulls back from its tight close-up on Orlan's face and pans the still-crowded operating room, as the assistants bustle about in preparation and the translators attempt to remain out of the way. The camera zooms back in on Orlan's face as Cramer leans over her, places a tender hand on the side of her head, and then pulls back her hair to begin the injections.

The close-up is relentless as the fine needle begins to pierce the skin of Orlan's scalp. Although Orlan's face remains almost motionless, her eye begins to water slightly and her voice is strained and almost robotic in her rapid-fire response to a question from the Gering Gallery about pain: these injections, she says, actually hurt quite a lot, although after them the pain will go. The camera pulls back to reveal Orlan's legs, which, as she points out with a faint smile, are moving in discomfort. The camera returns to a close-up of Orlan's face as Cramer directs the needle into the skin beneath and behind Orlan's ear. The injections in front of her ear have begun to bleed, and it is almost impossible not to hold one's breath and wince as the needle threads in and out, visible beneath the surface of the skin. "You okay?" Cramer asks, and Orlan tersely responds, "No problème," though she squeezes her eyes shut for a second as the needle moves underneath her eyebrow.

With the injections complete, the definitive gesture, the incision, can begin; Orlan nods slightly in assent, and Cramer proceeds. Holding the scalpel with the delicate grip of an artist, Cramer draws its point in front of Orlan's ear, from her lobe upward toward her temple, then around the back of the ear (fig. 26). Pausing, she says, "Orlan, if you feel anything, tell me, okay?" Bright light bathes Orlan's face, highlighting the blood that has begun to flow in earnest. Cramer slides dissecting scissors into the incision, their contours gruesomely visible as she opens and closes them beneath the skin, separating it from the underlying tissue. The delicacy with which Cramer palpated Orlan's skin, feeling for the underlying bones and tissues, contrasts with her vigorous, even violent movement with the dissecting scissors as she works them under the skin. As Orlan's flesh swells and bleeds, it is increasingly apparent what a difficult artistic medium it presents—even were its occupant not conscious, speaking, and moving. The marks Cramer traced earlier on Orlan's face become an ever-more necessary map, even as the skin on which they are inscribed stretches, moves, and opens. A call comes in from Toronto, drawing a comparison between Orlan's operation and Van Gogh's cutting off of his own ear, a comparison Orlan immediately dismisses. Whereas Van Gogh cut off his ear in a moment of madness, she says, such is not the case here: this performance is her art. "My blood is my painting," she declares in English—as the blood runs from the skin that pulls away from her ear like a mask. Moments later, she requests that the yellow surgical drape on which she is lying be displayed, raising her head so that it can be removed and held up as the camera zooms in on the blood staining it (fig. 27).

As the scissors move down to her jawline, Orlan gives a start and Cramer pauses to inject more anesthetic. Orlan's eyes water again as the needle moves through the flesh around her neck and jaw and the scissors enter the incision again, stretching the skin and tugging the corner of her mouth. Cramer continues to move the scissors under the skin, opening a space at Orlan's left temple. As the instrument slides below Orlan's eyebrow, it moves it, generating unexpected expressions on a face that is increasingly puffy and discolored. Cramer requests the implants, which are a light gray rather than the bright blue of those on the skull at the foot of the table. The intent had been that the transmission to the Sandra Gering Gallery would last through the insertion of the first implant, but as Cramer tries to place it, she realizes that there is still not enough space beneath the skin. She is working on continuing to loosen the skin from the face when the transmission—and thus the available video record—abruptly ends.

The Reincarnation of Saint Orlan, too, ended shortly after *Omniprésence*, with two more, less extravagant, performances that same year (fig. 28). Although Orlan had stated in multiple venues that she desired to have a surgery that would give her "the largest nose physically possible," at the moment no further surgical performances seem to be in the works.[215] Kate Ince writes that in fact a concluding surgery would have foreclosed the ambiguity and multivalence of the *Reincarnation* series: "As an end-point to

[215] Rachel Armstrong, a former medical doctor who consulted and collaborated with Orlan, details the difficulty, danger, and potential pain likely in such an operation, which would be significantly invasive and could have grave consequences. The proposed operation, she writes, had the potential not only to result in infection and pain, but in difficulty breathing and a change in Orlan's voice. Armstrong, "Working with Orlan," in *The Cyborg Experiments: The Extensions of the Body in the Media Age*, ed. Joanna Zylinska (New York: Continuum, 2002).

'Reincarnation,' the construction of a phallophanic nose would have marked a reneging on the open-ended, experimental identity work which has characterised Orlan's surgical project from the outset."[216] As long as future surgery performances are a possibility, then, *Reincarnation* remains unclosed and Orlan's identity and appearance perpetually unfixed and subject to change.

The photographs of *Omniprésence*, with their glowing light and saturated colors, are documents that record middle ground between the traditional "before" and "after" of cosmetic surgery, and are perhaps more equivalent to recordings of states of artists' work-in-progress than finished art objects. Yet Orlan insists that *Reincarnation* is not about a final end product, and is specifically not about shaping her face into a unified gestalt of classical beauty. In the days following *Omniprésence*, Orlan exhibited more in-between photographs at the Sandra Gering Gallery, one a day during her recovery, which she called "portraits produced by the body-machine." These images show a bruised and swollen Orlan, sometimes voguing coquettishly and other times staring blank-facedly. In the photograph from the fourth day after the surgery, Orlan gazes at the camera through bloodshot eyes ringed in deep purple bruises (fig. 29). Her pouting lips sport two dark scabs and a blueish bruise, and the skin of her face is swollen and puffy. She pops the collar of her jacket with both hands, holding the lapels against her cheeks in a pose that may or may not be intended to disguise the trauma to her skin. Her hair, still indigo and blond, flares in wild tangles about her face as she stares evenly at the camera, her gaze simultaneously a seduction and a challenge. In the face of so much delicate and damaged flesh, calling the body a machine seems particularly ironic and even whimsical.

[216] Ince, *Orlan,* 77.

The next year, in an installation at the Centre Georges Pompidou called *Omniprésence Nº* 2 (1994), these photographs were displayed as diptychs, each alongside a computer-generated composite of Orlan's face with one of the art historical beauties from *Imaginary Generic* (fig. 30). In the final diptych, Orlan wears full makeup and a striking coiffure that accentuates her high forehead and new bumps, a dark pompadour backswept over silver hair that reaches just below her ears (fig. 31). Paired with this photograph is a composite of all five of the project's muses: Venus, Psyche, the Mona Lisa, Diana, and Europa. The resemblance between the composite image and the post-surgical Orlan is not striking. Indeed, what she resembles most is the imagined "body-machine" with whom she credits the production of the portraits: her unexpressive face smooth, and, with the protruding bosses at her temples, vaguely robotic.

These images reinforce the fallacy of interpreting Orlan's surgically modified visage as the result of a quest for either beauty or a single fixed image. Ince records Orlan's exasperated response to these misinterpretations: "I said: 'Can you see my face? So you'll stop writing that I want to be the most beautiful woman, that I want the Mona Lisa's forehead or that I want to look like Botticelli's Venus, which is a beauty standard I'm fighting against.'"[217] Orlan's face, her skin opened, stretched, refigured and closed, hovers between a "before" that she never requested, and an "after" that never existed. The photographs record one history of *Omniprésence* and the unedited video tells a somewhat different story, but what remains, in its perpetual state of in-between-ness, is Orlan's face, the canvas of her skin.

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[217] Ince, *Orlan,* 45

Skin and Self

In 1974, French psychoanalyst Didier Anzieu introduced his highly influential model of the Skin Ego, which he later elaborated upon and published as a book of the same title.[218] Anzieu builds on Freud's concept of the Ego, or sense of self, but focuses on its relationship to, and development along with, the skin. Anzieu argues that all physical senses, as well as the ego itself, arise from the development of, and experiences gained through, an individual's skin. It is through the skin, Anzieu posits, that an infant first becomes aware of the world around it and its own place as an individual within the world; the skin, as a uniting, common sense, provides context for the other senses. Anzieu writes that this intimate relationship between skin and ego is physiologically fundamental, a claim he supports with an overview of developmental biology. The skin, he shows, is the first organ to develop, and remains the largest. As such, it literally provides for the development of all the other physical senses. In Jay Prosser's gloss, "Bordering inside and outside the body, the point of separation and contact between you and me, skin is the key interface between self and other, between the biological, the psychic, and the social. It holds each of us together, quite literally contains us, protects us, keeps us discrete, and yet is our first mode of communication with each other and the world."[219]

Because it covers the entire body, skin provides the sense of coherence and positioning in the world that is necessary for understanding the self and the other senses. The ego itself has a containing skin of sorts as well, containing and protecting the idea of

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[218] *Le Moi-Peau* (Paris: Dunod, 1985), published in English as *The Skin Ego,* trans. Chris Turner. (New Haven: Yale University Press, 1989), was based on a concept Anzieu had introduced in 1974 in the journal *Nouvelle revue de Psychanalyse.*

[219] Prosser, *Second Skins: The Body Narratives of Transsexuality* (New York: Columbia University Press, 1998), 65.

the self the way the skin of the body contains and protects it. Because of the intimate connection between the physical and psychical skins, ailments of the former can be useful for recognizing and treating ailments of the mind.

Michel Serres, whose *Le Tiers-Instruit* formed the textual basis for Orlan's fifth surgery performance and reliquaries, meditates on a similarly intimate, if more poetic, relationship between self and skin in "Veils," the first chapter of his book *The Five Senses: A Philosophy of Mingled Bodies*.[220] Serres devotes this chapter not only to the sense of touch, but to the unique role of the skin in uniting the other senses and forming the locus of the body's consciousness of itself. For Serres, the skin both houses, and *is*, the soul, which is felt and recognized at the points of most sensitive tactility and where one is conscious of one's inhabited and acting body. It can be felt in the fingertip when cutting the nails, and in both the lips and the finger when the two touch each other. The skin is where the self exists.

It is this intimate connection of skin and self and soul that fascinates Serres, along with the fact of its constant change. The skin, especially marked with cosmetics or tattoos, seems to reflect an individual's personality, yet in reality bears the marks and scars of forces largely beyond his or her control. Serres uses the metaphor of a tapestry to highlight the skin's dual roles as marked surface and external fabric of the self. Drawing from a discussion of the *Lady and the Unicorn* tapestries, commonly interpreted as illustrating the five senses, he examines how the threads that comprise the tapestry form its image as well as the canvas itself. Likewise, Serres argues, the skin links and mingles the senses and itself acts as a sort of an originary, primal eye: "In the beginning, touch; at

[220] Michel Serres, *The Five Senses: A Philosophy of Mingled Bodies,* trans. Margaret Sankey and Peter Cowley.(London: Continuum International, 2008).

the origin, the medium."[221] As in Anzieu's argument, the skin forms the "common sense" that precedes and provides for the development of all the senses.

Serres takes the materiality of the metaphor further, though, describing how the knots and threads visible on the reverse of the tapestry evoke both the "nerve threads" of a flayed skin and "[prefigure] a computer circuit board" like the "inside wiring of an automaton." [222] For Serres, the skin is not just a surface containing the body, an external integument of a separate internal reality, but instead is the stuff of the self and locus of the soul. As such, it is not perfectly tailored, but is rather an assemblage—"a suit, cobbled together with its seams visible."[223] This image evokes both the cloaks and the skin of his later harlequin Emperor of the Moon, who found himself marked and seamed, inside and out, by his travels. This patchworked, indeterminate, chimeric body stands in refutation of a fully visible self, neatly divisible between body and soul. As Serres puts it, "All dualism does is reveal a ghost facing a skeleton. All real bodies shimmer like watered silk. They are hazy surfaces, mixtures of body and soul."[224] It is the skin that puts an imagined Cartesian dualism to the lie.

In his introduction to the English translation of *The Five Senses,* literary theorist Steven Connor writes that this volume fits into Serres' larger project of describing the sensing, feeling body within the strictures of language. Connecting *The Five Senses* to Serres' 2007 *Hominescence* , Connor writes:

> …a quarter of a century after *Le cinque sens*, Serres will be able to represent his earlier work as a presentiment of the new body that he sees in the process of construction through knowledge: [Serres writes] 'Once, I wrote *Les cinque sens*, and, just now, the *Variations*, not just to celebrate

[221] Ibid, 35.
[222] Ibid, 60 and 77.
[223] Ibid, 61
[224] Ibid, 25

> this birth or advent, but to mark the changes they induced, and above all to understand a body that has recently become translucid and visible, denuded finally of the cuirass of alienation which imprisoned it in the past.'[225]

This "becoming" body has been made visible in its component parts, examined with technologies that see through the skin, dissected and analyzed. Serres makes a case for the integrated, feeling body in a similarly full world, and the skin the interface uniting the two and containing the self.

For both Anzieu and Serres, surface and self are connected via a metaphorical skin: the skin of writing. In concluding *The Skin Ego*, Anzieu writes that in completing the book, he has in a sense sealed his own skin ego. His words have become a container that unites and protects him. Similarly, Serres writes that with his own text, he is presenting his skin: "Painters sell their skin, models hire out their skin, the world gives its skins. I have not saved mine, here it is. Flayed, printed, dripping with meaning, often a shroud, sometimes happy."[226] His words, presenting like the skin their own history and memories, are analogous in their intimacy to that canvas of the body, locus of the self and soul, the skin.

If Anzieu and Serres equate their writing with sealing or presenting their own skins, Orlan inverts the equation. As she writes in her Manifesto, "Carnal Art transforms the body into language, reversing the biblical idea of the word made flesh; the flesh is made word."[227] Text plays an important role in Orlan's surgical performances, and she credits *La Robe* with her motivation to undertake the *Reincarnation* series. Yet, instead of

[225] Ibid, 14. Connors quotes Serres, *Hominescence* (Paris: Le Pommier, 2001), 47, and provides his own translation into English.
[226] Ibid, 38.
[227] Orlan. "'Carnal Art' Manifesto" in *Orlan: 1964-2001* (Salamanca: Ediciones Universidad de Salamanca, 2002), 218.

writing about or imagining a transformation of her skin, Orlan literally does write and donate her skin—"flayed, painted, and dripping with meaning." Orlan writes her skin, not by inscribing or tattooing it, though her surgeries do leave traces (though she rarely mentions her scars), but by making it a signifier, an object to be edited, read, and re-written. By making the flesh word, she participates in the rhetorical shift examined in the previous chapter, whereby life itself comes to be seen as code. By making language, or code, of her flesh, and using technology to upgrade that software, as she calls it, she writes her own self and future.

Indeed, Orlan's language makes it clear that although the relationship between skin and self may at times be an uneasy one, the two are intimately linked, and that the skin not only reflects the self, but that the self reflects the skin. In the passage she reads from *La Robe*, emphasis is on the skin not matching what one feels oneself to be: "Skin is deceiving… I have the skin of an angel, but I am a jackal."[228] Through surgery, she says, the external can be brought in line with the internal. Her citation of beautiful art historical models, chosen not just for their looks but for their character, suggests that the incorporation of their skins might carry some transformative power. Yet her very inclusion of these models in structuring her project reveals a seam, an uneasy suturing, between skin and self. Orlan insists that her appropriation of these beauties' physical features is not literal. The "skins" she takes from them may therefore be read as a film of entanglements: of filaments that link male artists' objectification of the female form; of an art history that sees only passive female objects of the male gaze; of forceful personalities that survive and persist even when their painted skins would erase them. Her own skin, as opened by the tool of plastic surgery, is further entangled—with societal

[228] Eugénie Lemoine-Luccioni, *La Robe*, p. 95; quoted and translated into English in Orlan, "Conference"

demands that females be (or at least appear) young and beautiful, the perception that beauty equals goodness, and with the skins of those who don't have access to a surgeon or even to basic healthcare.

Orlan's Posthuman Gesture

The idea of skin as self echoes in the cry of Marsyas, who, as Ovid relates in his *Metamorphoses*, is sentenced to flaying as punishment for losing a musical competition to the god Apollo. Ovid describes the gruesome scene in detail:

> 'Help!' Marsyas clamoured. 'Why are you stripping me from myself? Never again, I promise! Playing a pipe is not worth this!' But in spite of his cries the skin was torn off the whole surface of his body: it was all one raw wound. Blood flowed everywhere, his nerves were exposed, unprotected, his veins pulsed with no skin to cover them. It was possible to count his throbbing organs, and the chambers of the lungs, clearly visible within his breast.[229]

Not only does Marsyas equate his skin with his self, but the skin is clearly more than a thin covering; in Ovid's description, the stripping of the skin lays bare not merely subcutaneous tissues and muscles, but even the organs. The skin in this description behaves as a protective shell containing the self: its removal reveals the body's core, creating a clear delineation between inside and outside.

The flayed body holds a particular position in art history, as numerous paintings and sculptures of the flaying of Marsyas attest.[230] The scene invites the opportunity for the artist to display his prowess in anatomy, not only in the elaborate contortion of the musculature, but in the depiction of the body inside as well as out. Paintings of the scene, in particular, suggest a series of arresting juxtapositions—mortality and divinity, terror and calm, pained struggle and artistic deliberation, and even humanity and beastiality.

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[229] Ovid, *Metamorphoses,* trans. Mary M. Innes (London: Penguin Books, 1955).
[230] See, among others, Hellenistic sculpture; oil paintings by Titian, Guido Reni, Guercino, and Ribera; and frescos by Raphael and Tintoretto.

The scene even has a moral component, whether displaying the fatal hubris of Marsyas or suggesting his liberation from the prison of his flesh, both interpretations addressed by artist and theoretician Stephane Dumas in his essay "The return of Marsyas: Creative Skin." In his text, Dumas offers another interpretation: that Apollo, from the use of his voice in the earlier musical competition through the active flaying gesture, achieves true subjecthood in contrast to, but necessarily through, the objectified Marsyas. Drawing from an examination of Juseppe de Ribera's 1637 *Apollo Flaying Marsyas* (fig. 31), he writes, "*The Hanging Marsyas* is the passive object of the transitive verb "to flay" whose subject is Apollo. However it seems to me that this transitivity involves a degree of reflexivity. This in fact is why it expresses the action of a true subject. In a way, through the duel and then the flaying, Apollo and Marsyas form an indissociable pair."[231]

For Dumas, Apollo's gesture is thus one of self-creation and creativity. For an instant, Apollo becomes fused, through touch, with Marsyas, the linking visually emphasized, as Dumas argues, through the vermillion mantle that billows around Apollo, seeming to stem from Marsyas's like-colored wound. The two are linked, but it is Apollo who creates.

Orlan, too, is flayed, her skin pulled away from her face at the hands of another. Yet she is both artist and object, the creator and the skin that is pulled away. She not only remains conscious, but insists on her own control of the situation, directing the surgeon in an inversion of the traditional roles. As Orlan puts it, "I do not abandon my body to the surgeon's hands. I remain conscious and active: I read texts, I enter into dialogues, I orchestrate the accessories and costumes of the surgeons. I am left to their expertise and I

[231] Stephane Dumas, "The return of Marsyas: Creative Skin," in *Sk-interfaces,* 20.

give them mine."[232] She also denies pain through the use of intravenous analgesics; though the video certainly reveals her discomfort, there is none of Marsyas' tortured screaming. Instead of clamoring in terror, she smiles. Orlan is "stripped from herself" not as punishment meted out by a vengeful god, but at her own will.

Dumas's description of Apollo's flaying of Marsyas seems to begin to approach what Georges Bataille (whom he does mention briefly) calls sovereignty, a concept that can be read even more clearly through Orlan in *Omniprésence.* "…[S]overeignty," for Bataille,

> is always linked to a denial of the sentiments that death controls…. It also calls for the risk of death. Sovereignty always demands the liquidation, through strength of character, of all the failings that are connected with death, and the control of one's deep tremors. If the sovereign, or sacred, world that stands against the world of practice is indeed the domain of death, it is not that of faintheartedness. [233]

Bataille's sovereignty, influenced by Hegel's Master/Slave dialectic,[234] is the awareness that comes upon recognizing, and not fearing, the face of one's own death—the fugitive, miraculous moment that occurs outside of time and quotidian drudgery. This is the moment on display in the Greek sculpture of Laocoön, which German art historian Johann Joachim Winckelmann, to whom I will return momentarily, reads as the pinnacle of aesthetic achievement: perfect beauty despite—and even because of—the subject's obvious torment.[235] Art historian Simon Richter argues that, indeed, "the pain of the body

232 Orlan, "The Poetics and Politics of the Face-to-Face," in *Orlan: A Hybrid Body of Artworks* (New York: Routledge, 2010), 111.
233 Bataille, Georges. *The Accursed Share, Volumes II & III: The History of Eroticism and Sovereignty,* trans. Robert Hurley (New York: 1993), 222.
234 See G.W.F. Hegel, *Phenomenology of Spirit,* originally published 1807.
235 "Reflections on the Imitation of Greek Works in Painting and Sculpture," in *The Art of Art History: A Critical Anthology,* Donald Preziosi, ed. (Oxford: Oxford University Press, 1998).

is at the center of the aesthetics of beauty,"[236] a necessity, in art historian Jane Blocker's gloss, "to the story of triumph. If we remove pain, beauty becomes invisible or dead."[237] Art, from its position outside the economy of the useful, is uniquely positioned to capture this moment and express the sovereign. "What is the meaning of art, architecture, music, painting or poetry," Bataille asks, "if not the anticipation of a suspended, wonder-struck moment, a miraculous moment?"[238] He continues, "…[A]rt has no other meaning… art is always a response to the supreme hope for the unanticipated, for a miracle."[239] *Omniprésence*, with its risk, its danger, and its complete lack of utility, captures the essence of this sovereign gesture, the making of the "creative skin" that Dumas reads in Apollo.[240]

This opening of the skin, this sovereign, creative gesture, opens another sort of fissure, one that I argue creates a space of possibility for imagining the posthuman. We can't avoid being drawn into this negative space, this lacuna, and forced to confront what our own, ostensibly intact, skin contains and would seal out. To witness this horror-inducing act is to admit our own permeability—and potential. In thinking about the creation of this space, I am indebted to Parveen Adams, who offers a psychoanalytic reading of Orlan's work. For Adams, the crux of *Omniprésence* occurs in what she identifies an "unfillable

[236] *Laocoön's Body and the Aesthetics of Pain* (Detroit: Wayne State University Press, 1992), 160. Emphasis added.
[237] Jane Blocker, *What the Body Cost: Desire, History, and Performance.* (Minneapolis: University of Minnesota Press, 2004), 23.
[238] Bataille, *Accursed Share,* 200.
[239] Ibid, 206.
[240] Dumas defines his concept of the creative skin as "the skin of the creator (a term I use to take in both the artist and the receiver) metaphorically flayed and turned over to be offered as a medium for our representations of the world…As an element, the skin is in itself a medium, halfway between the world and the internal media of the visceral body, the meat body, or the sensory body….The "creative skin" is the medium in which a body takes shape and becomes writing. Even more than a projection screen, it is a thickness through which exudes legibility. It is a way of coming to the surface, a bunch of viscera outcropping in broad daylight."

gap [that] opens at the moment that the face is lifted."[241] In that moment, the skin becomes a mask, but with a space, rather than a face, behind it—a space that remains unseen. For Adams, who concentrates on Orlan's declaration of being a "woman-to-woman transsexual,"[242] which I will discuss shortly, this gap is the space where castration occurs, where Orlan becomes Woman-as-phallus-as -mage and denies the possibility of a fixed and definitive gender identity. She writes:

> The power of her work is here, in the surgical manipulation of her face, rather than in the conscious programme of art historical references which really are no more than rationalisations. It is here on the operating table that castration occurs; not in the act of cutting, not in the drama of the knife, not in the barely suppressed frenzy of it all, but in the space which is opened up. In the space in which the face is unmade. It is the space between the bloodied place which we see all around her ear and the face as it lifts from its customary base. Something flies off; this something is the security of the relation between the inside and the outside. It ceases to exist. There is, suddenly, no inside and no outside….It is the moment, a horrifying moment, of the birth of a new space which ruins habitual space.[243]

Orlan's surgery invites—and requires—a new kind of seeing. The opening of her face, as she continues to speak and interact, rouses a kind of horror unique to seeing the face become object and, in a way, disappear.

I don't read this space primarily as an effect or cause of a metaphorical castration, however, but rather as a space that invites the imagining of the posthuman. What we see as Orlan's skin is pulled back and her face transformed is not the lack of the phallus, or the impossibility of embodying Woman, but rather something simultaneously human and alien. We see a space emerging to imagine a new figure. By opening her skin and by

[241] Parveen Adams, The Emptiness of the Image: Psychoanalysis and Sexual Difference (London: Routledge, 1996) 158.
[242] Ibid, 159.
[243] Ibi,153-154.

facing what she has called "the life-risk of dying," [244] Orlan demonstrates the possibility of understanding body as machine, in its its non-naturalness and non-givenness, and with the possibility of upgrading it.

I want to return briefly to the question of Orlan's use of the term transsexualism, which has been (justifiably, in my opinion) criticized as being simplistic and suggesting that gender transition is simply about a superficial, skin-deep transformation. In his book *Second Skins*, transsexual scholar Jay Prosser recounts attending Orlan's gallery talk at the Sandra Gering Gallery in December of 1993, when "Orlan: Omipresence" was displayed there. During the question and answer period, he writes,

> [A]fter mentioning the work I was then beginning on transsexuality, I asked Orlan about the relation of body and identity in her work. Did she feel any sense of identity transformation, of an internal shifting, as her face underwent its successive alterations? Was the transformation really only skin deep? (I wondered what it was like to wake up to a different face each morning; I wondered how she sustained her self in the face—literally—of such change). Skimming over the substance of my questions (there were problems in translation) but picking up my reference to transsexuality, Orlan replied simply that she felt like "une transsexuelle femme-à-femme."[245]

A few pages later, he mentions Adams' essay, explaining, parenthetically, that the exhibition he had attended had been televised—seeming to suggest that the formulation "une transsexuelle femme-à-femme" may have had its genesis at that moment. Certainly Orlan has used the phrase since, but its record in Adams' essay seems to be seminal—and widely criticized by scholars of transsexual studies. Diane Morgan calls Adams' approach emblematic of "psychoanalytical theory's more or less consistently dismissive

[244] Orlan, "Autobiography." http://www.orlan.net. Orlan used this phrase in reference to her initial, unintended foray into surgery as performance, which occurred in Lyon in 1979. She was at a performance symposium when she had to be whisked away for the emergency treatment of an extra-uterine pregnancy; she writes that she "decided to make the most of this new adventure by turning the situation in on itself, by considering life an aesthetically recuperable phenomenon," and sent video back to the gallery as if had been an intended performance. See Orlan, "Orlan's Speech," 219.
[245] Prosser, *Second Skins*, 62.

attitude to transsexuality."[246] However, Alluquére Rosanne Stone, herself a transgendered person and one of the founders of transgender studies, had another take on Orlan's use of the phrase, writing:

> …I am particularly fond of her appropriation of the hot-potato word *Transsexual* for an unholy purpose for which it was never intended. In one of her interviews she uses the term female-to-female transsexual. I saw this remark as playful and ironic, because of the way it stands binary opposition on its head. Once the idea of female-to-female transsexuals is possible, the lid is off the worm can. [247]

I agree with Stone that the comment was intended to be playful, although I do still find Orlan's usage of such a complex fraught, "hot-potato" word rather simplistic and damaging. Nonetheless, her appropriation of this phraseology does again underscore Orlan's larger claims that changing the skin can effect a fundamental change in identity.

Cyborgian and Christian Imagery

When Orlan gives presentations to English-speaking audiences, she likes to joke, through her interpreter, that she was unable to find the proper batteries for the automatic translation implants in her temple bumps, and apologizes for having to use an interpreter instead. The bumps, which she highlights with iridescent or sparkly make-up, contain no electronics, but do have a high-tech, alien look (fig. 33). Though covered by Orlan's skin, they are simultaneously a part of her body and foreign to it. As low-tech as her bumps are, Orlan is physically a cyborg through the incorporation of silicone into her own flesh.

Metaphorically, however, Orlan's project is even more deeply cyborgian. Her claim, "This is my body, this is my software" (fig. 34) evokes the trope of body as machine, a comparison that has roots at least as far back as Descartes. Yet whereas the body-

[246] Diane Morgan, "What Does a Transsexual Want?" in *Reclaiming Genders: Transsexual Grammars at the Fin de Siecle*, ed. Kate More. (London: Continuum, 2000), 233.
[247] Alluquére Rosanne Stone, "Speaking fo the Medium: Marshall McLuhan Interview," in *Orlan: This is my body… This is my software…* (1996), p. 47

machine Descartes envisioned was an earthen vessel piloted by a soul inhabiting but distinct from it, the more contemporary metaphor of software raises different possibilities. In the cyberpunk imaginary, the self is seen as a digital construct, like software, running on the hardware of the body but transferable to other "media," including other machine-bodies.[248] Orlan's performances demonstrate not the separability of self and body, or hardware and software (they are emphatically in-body experiences, for performer as well as spectators), but rather the possibility of each for replacement and reprogramming. The body is no longer given, but modifiable.

The phrase "This is my body" comes, as do many of the themes in Orlan's oeuvre, from the Christian tradition, in this case the Eucharist celebration. The gospels of Matthew, Mark, and Luke record Christ's words to his disciples at the Passover supper before his crucifixion as he breaks the bread and shares the wine: "This is my body… this is my blood."[249] Christ is foreshadowing his coming death and explaining that the sacrifice of his opened and broken body will provide forgiveness for his followers. Orlan, who specifically denies her performances as being either masochistic or sacrificial, nonetheless appropriates this Biblical language, making a strong claim for the body freed from the strictures and taboos of the Christian tradition. By identifying the body with the technology of software, she challenges a view of the body as given by a creator and thus hallowed and inviolable. The opening of her skin is not an act of suffering or atonement, but of rewiring her circuits or upgrading her firmware.

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[248] See, among many others, William Gibson's *Neuromancer*; Richard Morgan's, *Altered Carbon;* and Anne McCaffrey's, *The Ship Who Sang*.
[249] Matthew 26:26-28, Mark 14:22-24, Luke 22:19-20. King James Version.

This denial of an Edenic origin story, as much as her impure mingling of "organic and technological flesh"[250] most closely aligns Orlan with the cyborg Donna Haraway imagines in her famous Manifesto of 1985. For Haraway, the cyborg, an amalgamation of organism and machine, is a metaphor for exploring agency in an ever-more wired and networked world. This autopoetic origin story and unnatural fusion suggests a figure of "transgressed boundaries, potent fusions, and dangerous possibilities."[251] Rather than cowering in the face of the "informatics of domination,"[252] which represent the webs of power present in an increasingly technologically-mediated social reality, the cyborg, illegitimate and resistant hybrid, has the power to navigate this new terrain. "Cyborg imagery," Haraway writes, "can suggest a way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves."[253] During surgeries, Orlan's skin likewise complicates easy dualisms of inside and outside, mind and body, organic and technological. Orlan is, like Haraway's imagined cyborg, a figure who interacts intimately with technology, combining body and tool into a single, multidimensional force.

In her later work *When Species Meet* (2008), Haraway explores the implications of a world rendered increasingly cyborgian by expanding scientific knowledge and technologies. There she addresses what Sigmund Freud, as early as 1916, identified as cracks in the liberal humanist edifice (oft-cited as the origins of a posthuman perspective)—what he called three "major blows at the hands of science" to the "*naïve*

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[250] Donna Haraway, *When Species Meet* (Minneapolis: University of Minnesota Press, 2008), 11.
[251] Haraway, "A Cyborg Manifesto," in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), 154.
[252] Ibid, 161.
[253] Ibid, 181.

self-love of men." [254] These were the Copernican revelation that the earth was not the center of the universe; the Darwinian theory of evolution that revealed humans' small distance from other animals; and his, Freud's, pronouncement that man is not even the master of his own mind. To these three, Haraway adds a fourth, "the informatic or cyborgian [wound], which infolds organic and technological flesh and so melds that Great Divide as well."[255] Again, Haraway's language is metaphorical, but Orlan's wounds are literal: an actual infolding of the technological within her organic flesh. As she lies on the table, celebrating the lack of pain through the intervention of analgesics, conversing with real-time viewers through the communications technologies that surround her, and prepared to receive under her flayed skin upgrades to her own hardware, she embodies the nature of the cyborg: unfixed, changing, and an indeterminate figure between the human subject of the past and the technological realities of the present.

Posthuman Skin

In her book *Skin: On the Cultural Border Between Self and the World,* literary scholar Claudia Benthien traces the changing perceptions of skin across recent history, positing that even though developing medical technology has allowed unprecedented access to the interior of the body, the skin is seen as a more rigid boundary than ever before. Benthien examines skin metaphors in multiple languages to trace skin as something that houses, hides, or reflects the true self, and she identifies a fundamental change in interpreting the skin taking place during the 18th century. In the 17th and 18th centuries, she writes, the body was seen as "open," such as in philosopher Mikhail Bakhtin's description of the

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[254] Quoted in Neil Badmington, "Introduction: Approaching Posthumanism" in *Posthumanism* (New York: Palgrave, 2000), 6.
[255] Donna Haraway, *When Species Meet* (Minneapolis: University of Minnesota Press, 2008), 11.

"grotesque body."[256] The skin was pervious to water and other dangerous substances, and also allowed for the exit of toxins—and in turn the diagnosis of internal maladies—through wounds. However, by the late 18th century, Benthien writes,

> skin had already become simply a place of passage to the inside. The dissection of the body in anatomy created a model of knowledge based on dismemberment, extraction, and disembodiment. A mechanizing view of the body gradually took hold. Today it finds its logical continuation in transplantation medicine, the final conquest of the inner corporeal space, what Virilio has called, for now, the 'final political form of domestication' (1994, 108-109). The implantation of human organs and eventually also of technological devices leads to a forceful abolition of the classical distinction between internal and external, a distinction traditionally marked by the skin. But the many literary and historical documents I examine in this study reveal that in terms of the history of mentalities, this development has by no means rendered the notion of skin as a boundary superfluous in the collective imagination—on the contrary that notion has taken on even greater significance.[257]

The idea of skin as a fixed boundary, therefore, a sort of garment protecting the inner self from the outside world, persists, even as medical technologies allow the body to be entered and visualized in ways that belie that ostensibly inviolable border.

Interestingly, although her focus throughout the book is on literature, in her introduction, Benthien briefly mentions a variety of contemporary art projects to illustrate the primacy of the skin in contemporary culture and imagination. The first of these examples is Orlan, to whom is devoted a single, inaccurate sentence: "The contemporary French performance artist Orlan, for example, undergoes continual surgery to shape her face to the ideal of beauty found in classic Renaissance painting (e.g., Botticelli's Venus or Leonardo's Mona Lisa), all the while documenting this bloody metamorphosis of the

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[256] See Mikhail Bakhtin, *Rabelais and His World*, trans. Hélène Iswolsky (Bloomington: Indiana University Press, 1993).
[257] Benthien, *Skin,* 11

self transformed into the image."[258] Benthien is correct neither about Orlan's surgeries being "continual," nor about her quest being directed toward ideals of classical beauty, but she *is* correct in identifying Orlan as an artist whose "works and performances deal quite concretely with skin as a place of encounter."[259] She also provides a useful frame for thinking about the ways in which Orlan's performances allow us to imagine a skin that is neither a pre-modern, open, osmotic skin, nor a fully sealed, rational, and self-containing skin, but something that goes beyond either. I identify Orlan's skin as posthuman: cyborgically mingling flesh and technology, refusing a single given truthfulness, perpetually indeterminate and unfixed. This visible skin resists both the idea of the perfectly self-contained, bordered, liberal humanist subject, and the triumphal, technologically-enhanced superhuman.

As a border of the self and a feature that visibly differentiates man from animal, the skin is of particular significance for the liberal humanist subject. It functions as the imagined boundary that allows the distancing from the world necessary for this subjecthood. This distance is crucial to philosopher Immanuel Kant's formulation of the aesthetic, which can only be judged from a position of "disinterestedness" and separation of self from the sensations or personal goals that would cloud rational recognition.[260] This potent concept of the aesthetic, critical theorist Terry Eagleton argues in *The Ideology of the Aesthetic*, came to stand for and enable Enlightenment thinking about subjectivity,

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[258] Ibid, 2.
[259] Ibid, 2.
[260] Immanuel Kant, "The Critique of Judgement," in *The Art of Art History*, ed. Donald Preziosi (Oxford and New York: Oxford University Press, 1998), 20. "One must not be in the least prepossessed in favour of the real existence of the thing, but must preserve complete indifference in this respect, in order to play the part of judge in matters of taste. This proposition, which is of the utmost importance, cannot be better explained than by contrasting the pure disinterested delight which appears in the judgement of taste with that allied to an interest—especially if we can also assure ourselves that there are no other kinds of interest beyond those presently to be mentioned."

politics, and power. For Eagleton, the idea of the aesthetic is rooted in the body, where it mediates "between the material and the immaterial; between things and thoughts, sensations and ideas." [261] The aesthetic allows for physical sensations and perceptions to be brought into the realm of the mind and brought under the control of reason. It is a recognition of "our creaturely life," as he calls it, and formalized in such a way that this shared experience of the embodied aesthetic comes to be understood as a universal that can link (a certain segment of) humankind. As Eagleton explains, "When, for Kant, we find ourselves concurring spontaneously in an aesthetic judgement, able to agree that a certain phenomenon is sublime or beautiful, we exercise a precious form of intersubjectivity, establishing ourselves as a community of feeling subjects linked by a quick sense of our shared capacities."[262] The aesthetic, then, understood as a rationalizing of phenomenological experience, allows, Eagleton argues, for a universal subjectivity, which creates "an entirely new kind of human subject—one which, like the work of art itself, discovers the law in the depths of its own free identity, rather than in some oppressive external power."[263] This liberal humanist subjecthood, then, depends fundamentally on an awareness of shared embodiment, but a separation effected by reason. The subject recognizes himself, through his "disinterested" observation of the world, as an entity separate from that surrounding world, and, by extension, from a controlling deity: enclosed, rational, and entirely independent.

In Eagleton's formulation, the body is the locus of the aesthetic; I propose that the skin can be understood as emblematic of the humanist subjecthood to which it gives rise. The skin in this view is what acts as the physical and literal barrier of the self—the object

[261] Terry Eagleton, *The Ideology of the Aesthetic* (Malden: Wiley-Blackwell, 1991), 13.
[262] Ibid, 75.
[263] Ibid, 19.

that allows for a perceived separation from the world. It is itself the limen that translates between material and immaterial, things and thoughts, sensations and ideas. Anzieu describes the skin as the source from which all other perceptive organs arise, and the sense of touch as the "common sense" that unites other perceptions. The skin, then, as the primary source of input, performs the unique role of delivering sensations to the intellect, while simultaneously serving as that marker of difference between the individual and the environment.

Difference as demarcated by the skin, however, clearly has a sinister aspect that belies the vaunted language of universality in Kant's philosophy. At the same time he expounds upon an aesthetic based on an "inner, personal interrelation between subjects as rational and feeling beings,"[264] however, and imagines a taste marked by "universal communicability," an "accord, so far as possible, [between] all ages and nations… from grounds deep-seated and shared alike by all men,"[265] unspeakable violence was occurring throughout the Atlantic. This violence, exercised upon the same sensing, feeling bodies that should have merited common subjecthood, instead emphatically denied it to millions in the Atlantic world, from Africa to North and South America, based largely on the color of their skin.

Kant's discussion of physical attractiveness, versus the pure aesthetic, makes it clear that although he imagines the aesthetic as universalizing and unifying, an implicit hierarchy is still at play when it comes to "all ages and nations." Perception of physical beauty, he writes, depends on the accepted notions of beauty in a particular location, based on that region's average physiognomy. Because of this, "a negro must necessarily

[264] Quoted in ibid, 97.
[265] Kant, "Critique," 90.

(under these empirical conditions) have a different normal idea of the beauty of forms from what a white man has, and the Chinaman one different from the European."[266] The "*ideal* of the beautiful," however, which can only be reflected in the human figure, requires not only "correct" features, but a reflection of "moral ideas," such as "benevolence, purity, strength, or equanimity," which are expressed visibly.[267] Although he makes a nod to inclusivity, then, the white, European male, with his attendant cultural values, is arguably the true (if invisible) standard against which other ideas of beauty are merely imperfect versions.[268]

Within the discipline of art history, Winckelmann is even more explicit about the connection between skin color and superiority. According to his "environmental" theory, different regions of the world produce distinct types of people, distinguishable by their skin tones. The weather and temperatures of various zones, by this theory, result not only in differently colored skin, but in fundamental differences in character and ability. The idea of the aesthetic, in his writing, becomes not something universally appreciable, but instead the indication of the superiority of the tastes of those with lighter skin. For Winckelmann, this excellence of taste reaches its aesthetic and intellectual apex with the classical Greeks, whose celebration of the human form and spirit embody true artistic greatness. It is interesting to note that the sculptures that Winckelmann so admires are, in fact, not only Roman copies,[269] carved in marble, rather than cast in bronze like the

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[266] Ibid, 92.
[267] Ibid, 93.
[268] See Richard Dyer, *White*, for an excellent discussion on the invisibility of whiteness.
[269] As Whitney Davis points out, Winckelmann was unable "to conceive a Greece outside its afterimaging Rome" (49)

originals—and, by the time Winckelmann encountered them, sparkling pristinely white, denuded of the skin of polychromy that would have covered them originally.[270]

This imagined, invisible whiteness becomes for Winckelmann the symbol of artistic greatness in his beloved ancients, and for Kant suggests an aesthetic that can create a universal brotherhood, in spite of the physical differences he nonetheless points out. Yet real skin—never white, but an innervated, metamorphosing spectrum of shades—does serve the function Kant envisioned for the aesthetic. Skin is something all living humans have in common; it is impossible to live without the skin, the only sense organ that also serves a vital protective function. Skin may be different colors, but pulled back, it reveals the same stuff; to quote Serres again, "What can the common monster… show to us right now under his skin? Yes, Blood and Flesh." [271] If a genuine intersubjectivity can be located in a particular awareness, as Kant suggests the aesthetic can, I propose that it exists in the skin, and more specifically, in empathy to expressions of others' pain to the skin. It would seem that we are essentially evolutionarily programmed to flinch when we see another's expression of pain: involuntarily to sense, empathically as if in our own skin, the other's suffering.

In her classic *The Body in Pain,* English professor Elaine Scarry writes about the inexpressibility of physical pain: the impossibility of using words—even when pain is not actively robbing one of them—to make one's experience of pain visible to another. She writes that "To have pain have is to have *certainty*; to hear about pain is to have

[270] Archaeologist Vinzenz Brinkmann writes that the "abundant paint traces" found on so much of the marble sculpture from Delos indicates that polychroming was "the usual procedure," and that, as a result, "We must accordingly picture even the famous *Laocoön Group* artfully endowed with colour." "Statues in Colour: Aesthetics, Research and Perspectives," in *Circumlitio: The Polychromy of Antiuqe and Medieval Sculpture* (Munich: Hirmer, 2010).

[271] See page 13

doubt."[272] One's own pain is what can't be *un*-grasped, but it is equally impossible to grasp the pain of the other (4). The pain of another, even as it is described in language, is inaccessible: it may "seem to have the remote character of some subterranean fact, belonging to an invisible geography that, however portentous," Scarry writes, "has no reality because it has not yet manifested itself on the visible surface of the earth" (3). However, when that pain does become visible on the surface, it will "immediately convey to anyone present the sentient distress of the person hurt," so "suggestively" that even if the wounded person "is not actually in pain, [she] may find it difficult to assure the companion" of as much (15). That shared sentience is ultimately what does allow for the making visible to pain to another person; Scarry writes:

> we will see that the story of *physical pain* becomes as well as story about the expansive nature of human *sentience*, the felt-fact of aliveness that is often sheerly happy, just as the story of *expressing* physical pain eventually opens into the wider frame of *invention.*(22)

As "visible surface," the skin, when wounded, is uniquely able, in the absence of any words of description, to evoke empathy.

The skin's unique ability to evoke empathy is highlighted in the 1982 Ridley Scott film *Blade Runner*, even when the skin in question isn't human. *Blade Runner* features androids called Replicants, who are visually indistinguishable from humans in behavior as well as in appearance.[273] The only way of definitively telling the two apart, shown at work in the opening scene of the film, is the "Voight-Kampff" test, which uses an individual's physiological responses to hypothetical scenarios to measure empathy—the quality that distinguishes humans from Replicants. This sensibility—or lack of it—is also revealed in the Replicants' skin. Midway through the film, escaped Replicants Pris and

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[272] *The Body in Pain: The Making and Unmaking of the World* (Oxford: Oxford University Press, 1985).
[273] *Blade Runner*, directed by Ridley Scott (1982; Los Angeles, CA: Warner Bros.).

Roy Batty seek out “genetic designer” J.F. Sebastian in his home, intent on gaining an extension to their pre-programmed lifespans (fig. 35). In a scene that opens with a close-up of eggs bobbing in a beaker of loudly bubbling water, Sebastian is unable to stop staring at the physical perfection of the individuals he helped to design, and giddily requests, “Show me something!”

“We’re not robots, Sebastian,” Batty chides him. “We’re physical.” Pris, rising to drape her arms around Sebastian’s shoulders, declares, “I think, Sebastian; therefore I am.”

“Very good, Pris,” Batty nods. “Now show him why.”

In a series of moves that simultaneously support and belie Batty’s first assertion of their physicality, Pris easily executes a gymnastic back walkover and steps to the steaming beaker as the cringe-inducing diegetic bubbling again surges. Prolonging the dramatic moment, the camera cuts to Roy’s look of concern, a close-up of the boiling eggs and burner, and finally back to Pris, as she plunges her hand into the water and lingers there before extracting and flinging an egg to Sebastian—who is forced to drop it almost immediately (fig. 36). Though we don’t see Sebastian flinch at Pris’s action, the scene’s editing certainly plays on audience empathy to heighten the tension, the sound of the burbling flask a vivid aural cue to the pain the boiling water would inflict on the skin. Moments later, as the Replicants insist that Sebastian take them to his boss, their ultimate creator, the bubbling again rises to underline their sinister purpose, and again we feel the threat in our own skin.

The hairless skin of the human, in any of its multicolored variations, also distinguishes it from other animals, a distinction that the liberal humanist subject considers superiority. Scholars working in the increasingly influential field of animal studies have problematized this assumption of innate superiority, examining the ethics of using non-human animals, as well as what our treatment of them reveals about ourselves. For literary scholar Cary Wolfe, the entire idea of the "subject" takes on new meaning when we ask whether it can be applied to non-human animals, particularly as humans' historical treatment of other animals has been, and continues to be, so violent and exploitative. Indeed, the title of his 2003 book, *Animal Rites,*[274] plays deliberately with questions of subjecthood. The "rites" of the title refers to Wolfe's intention to "take seriously the question of the animal," while the homophone it suggests, "animal rights," raises the question of what it would mean for animals to be granted the status of subjects under the law, and thus entitled to its particular assurances and benefits.

Animals, it is clear, are not only not granted rights under the law, but are considered a natural resource rather than individual entities: they produce food, leather, wool, and other materials for which humans breed, raise, and eventually kill them. Wolfe uses Jonathan Demme's *The Silence of the Lambs*[275] to ground his discussion of a "speciesism" that "marginalizes and objectifies the other solely based on species, but also [suggests] a whole network of material practices that reproduce that logic as a materialized *institution* and rely on it for legitimation."[276] The film, with its specific focus on skin, and particularly skin as garment,[277] allows Wolfe to highlight the "speciesism" latent in it and in contemporary society. This occurs, Wolfe argues, through

[274] (Chicago: University of Chicago Press.)
[275] *The Silence of the Lambs*, directed by Jonathan Demme (1991; Los Angeles, CA: Orion Pictures Corporation).
[276] Cary Wolfe, *Animal Rites: American Culture, the Discourse of Species, and Posthumanist Theory*, (Chicago: University of Chicago Press, 2003), 101.
[277] The serial killer "Buffalo Bill," whose pursuit by law enforcement drives the plot of the film, "farms" his victims for their skin, flaying them in order to sew himself a garment of their skins.

the animalization and humanization of both animals and humans, which Wolfe maps out on a sort of grid, with "animalized animals" at one end and "humanized humans" at the other. Animalized animals, he writes, through "the ongoing practices of violence against nonhuman others 'so vital to our modernity,' as Derrida ironically notes ('Force of Law,' 951)," come to be seen as expendable. "Demme's film," Wolfe writes, "like the 'humanism' and 'modernity' Derrida critiques, takes for granted the fundamental sacrifice of *nonhuman animals* (in what we eat, what we wear, the testing of the products we buy, etc.), which must continue to be legitimized if the ideological work of marking human others as animals for the purposes of their objectification and sacrifice is to be effective."[278] At the far end of the spectrum from animalized animals is "the wishful category of the *humanized human*, sovereign and untroubled,"[279] the subject whose unquestioned superiority is the justification for taking and wearing the skins of other animals. Between these two poles lie the categories of humanized animals (notably, house pets) and animalized humans (paradigmatically those the state incarcerates and executes).[280] In *Silence*, the protagonist must seek the help of one of these felons, a former psychiatrist imprisoned as a murderer and cannibal, in order to find the as-yet unincarcerated Buffalo Bill, wanted for his crimes of killing and skinning humans. As Wolfe's argument makes clear, the law condemns the killing, eating, and skinning of humans against a backdrop, rendered invisible by the film and by society, of systematic practices of killing, eating, and skinning animals.

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[278] Wolfe, *Animal Rites,* 101.
[279] Ibid.
[280] One thinks here of the "state of exception" that Giorgio Agamben describes in *Homo Sacer: Sovereign Power and Bare Life.* (Stanford: Stanford University Press, 1998.) In this zone, the individual exists between the "zoe" of pure, animal life, and the "bios" of human, social, political life, and is subject to the sovereign (state) that can at any moment declare that individual merely animal.

Another project that highlights the “network of material practices” that Wolfe identifies as inhering in speciesism is Oron Catts and Ionat Zurr’s *Victimless Leather—A Prototype of Stitch-less Jacket Grown in a Technoscientific Body* (2004) (fig. 37). The rather prolix title lays out the parameters of the project: the artists grow “leather” outside a natural body, in a laboratory environment that would seem to render unnecessary a “victim”—a living body that must be killed and skinned in order to clothe another. Yet the body, outside of which skin cannot exist as such—becoming, when it is put into use, leather, through processes that are chemical as well as semiotic—does not exist here. These substitutions of bioreactor for body, bloodless cells for leather, and machinery for a would-be “victim” unite to form their own skin: a linguistic creation posthuman in its own way and an apropos foil for understanding Orlan’s performances.

Although it was most recently on display at the Museum of Modern Art in New Work, *Victimless Leather* looks more like something out of a mad scientist’s laboratory than what one might expect to encounter in an art museum. The thin arms of a metal stand support three laboratory vials connected by a series of tubes and illuminated by a red indicator light that bathes everything in a pinkish glow. On the left, an indeterminate liquid beads on the inside and collects in the bottom of a flask fitted at the top with a rubber stopper. On the right, thin filaments coil inside a smaller vial, also stoppered and nearly full of a similarly fuchsia-tinged liquid. Curving tubes connect the flasks to a peristaltic pump behind the stand, as well as to the piece’s focal point, which rests above and between them: a clear globe, beaded inside with moisture, and housing what appears to be the tiniest of leather jackets.

Victimless Leather is replete with unexpected juxtapositions, contradictions, and transfusions. The project depends upon cutting-edge scientific technology, yet its beakers and labware seem deliberately to evoke an older—if not science-fiction—aesthetic. The miniscule size of the jacket is almost playfully whimsical, yet its fabric of living cells alludes to serious ethical questions, especially of medical research and genetic engineering. One of the boundaries the project addresses and blurs most productively, however, is a physical one: the skin. Physically and metaphorically multilayered and indeterminate, *Victimless Leather* calls attention to skin itself and, beyond the ethical implications of wearing the skin of another organism, the skin's fragile and imperfect function as marker and boundary. It is the very in-between-ness and indeterminacy of *Victimless Leather*, as especially revealed through this multilayered "skin," that makes it a provocative and productive model for understanding posthuman subjectivity.

Victimless Leather was created by Oron Catts and Ionat Zurr of the Tissue Culture and Art Project, which they co-founded in 1996. The two are currently artists in residence at SymbioticA, of which Catts is the director, a biological laboratory at the school of Anatomy and Human Biology at the University of Western Australia that facilitates artistic production and resources in so-called wet biology practices.[281] At the core of the Tissue Culture and Art Project, according to its founders, is the "artistic manipulation of living materials using the tools of modern biological research in order to sharpen questions arising from the utilization of these new sets of tools."[282] The scientific tool the artists use in *Victimless Leather* is tissue engineering, wherein new tissue is grown, usually over some sort of matrix, from living cells. Before *Victimless Leather*, Catts and

[281] http://www.symbiotica.uwa.edu.au/
[282] Catts and Zurr, "Growing Semi-Living Sculptures: The Tissue Culture & Art Project," Leonardo 35:4, p. 365.

Zurr produced several other artworks requiring care, feeding, and protection, and straddling, sometimes disturbingly, the line between living and inanimate: "Semi-Living" sculptures, as the artists call them. Among these were the 2001 *Pig Wings Project*, in which pig bone tissue was cultured and grown over matrices in the shape of wings, and the 2003 project *Disembodied Cuisine*, in which they grew, and ate, miniature "steaks" from frog muscle cells (fig. 38).

Certainly these pieces aren't without their sensationalist aspects, and *Victimless Leather* is no exception. It would be a mistake, however, to dismiss these Semi-Living sculptures as merely shock art. Through these projects, the artists make visible just a few of the increasing ways in which technology is able to intervene in, and even define the parameters of, life itself. *Victimless Leather,* especially, also illustrates vividly the increasing awareness of our inseparability from our Others, organic and technological, that characterizes the posthuman experience.

The skin of *Victimless Leather*, and the heart of the project, manifests this intermixture between organisms and between the organic and technological. The titular leather is actually tissue formed from immortalized[283] cell lines: here, human bone cells overlaying mouse connective tissue cells. The artists are concerned with provoking conversations on how humans interact with, and most often exploit, their animal Others—using them to grow body parts or other medical products, consuming them for food, or wearing them as garments—but beyond that, this project raises questions about

[283] Immortalized cell lines are those that have been altered in such a way that they continue to "grow indefinitely in culture." (Lakshmi Sandhana, "Jacket Grows from Living Tissue." http://www.wired.com/science/discoveries/news/2004/10/65248) In the case of the 3T3 mouse cells used for this tiny jacket, the original donor is long dead, but immortalized, in more ways than one, decades after its death, through a cell line frequently used in scientific research centers worldwide. (Catts and Zurr, "Growing Semi-Living Sculptures: The Tissue Culture & Art Project," Leonardo 35:4, p. 366.)

what it means to be a human subject. It casts a revealing light on the fragility, permeability, and tenuousness of what would seem to be the most personal and definitive border of the self: the skin.

The tiny jacket of *Victimless Leather*, the color of raw flesh and glistening with moisture, clearly represents no ordinary skin. It has a distinctly alien quality, lent not merely by the scientific apparatus housing it, but by its indeterminacy. We are used to receiving from skin, as the outer layer of an organism, visual clues of identity and origin, but this skin reveals not even its species, let alone ethnicity or status. Detached from any organism it might be expected to identify, it is, of sorts, a free-floating signifier. Additionally, this skin seems almost to pulsate with life, which is never a quality associated with leather. The conversion from skin (which will decompose and decay if left untreated) to leather is a chemical and physical one that at the same time removes traces of the former occupant in order to create a durable material suitable for product manufacture. This particular "leather," however, dripping with nutrient medium and glowing rosily, hovers in an indeterminate zone, and is visible alive enough to provoke the curator's guilt at having to "kill" the piece, as will be discussed later.

An organism's skin serves many functions, including protecting, bounding, and sensing. A leather garment can protect against the elements, but living skin serves an even more important defensive function, providing crucial protection for other organs and muscles, acting as a waterproof barrier, and defending against the invisible threat of invading microbes. Remarkably resilient and quick-healing, skin is nonetheless a fragile barrier, prone to damage and scarring as it shields the body as a whole. In the case of *Victimless Leather,* however, the skin is inside the "technoscientific body" described in the title, not offering but receiving protection. The tissue of the jacket must be protected from the bacteria that would kill it, precisely because it lacks skin of its own. Thus, it remains quarantined not just within its protective flask, but within the sterile bioreactor.

Skin, as the outer border, as it were, of an individual's body, also serves as a tangible boundary of the self. Yet the skin of this jacket bounds nothing—it is an empty garment—and is indeterminate in its own existence: living or inanimate, human or animal, natural or artificial. It is an extreme manifestation of Serres' Harlequin's coat. It is unclear what, if anything, steers this organism—the creators who set these cells in motion, the peristaltic pump providing nutrition to the tissue, or some elusive natural force. Unlike human skin, or even Orlan's opened, altered skin, this "skin" seems to have a mind of its own. Curators at MoMA ultimately had to stop the flow of nutrients to the project because it was growing out of control, as if staging a break from the confines of its bioreactor. When a similarly out-of-control growth occurs in the body—not uncommonly on the skin itself—those haywire cells, driven to continue reproducing their damage, are called cancer. Not only did this skin *of Victimless Leather* bound nothing, but unconnected to a contained organism, its growth was unchecked and unstable.

Finally, skin not only bounds a subject, acting as border between self and Other, but leads to an awareness of self through the presence of the Other. It is not merely border or barrier, but an organ of reception; it is impossible to touch without feeling the touch of the Other.[284] This presentation of skin also reminds us of the interconnectedness made

[284] For a discussion of the consequences of this sense of mutual touch and the model it suggests for thinking citizenship and selfhood, see Manning, Erin. *Politics of Touch: Sense, Movement, Sovereignty*. Minneapolis: University of Minnesota Press, 2007. "The body as a sensory modality engages with an other through a touch that exudes potential violence in its desire to transform the space between self and other. What differentiates this from the national body-politic's organization of the body is the fact that touch as a reaching-toward is a means without an end. There is no final destination where touch is concerned. In fact, there is no self or other as such. The body is the intermediary through which I create, with you, the shared

possible by advanced medical science, whether in its positive aspects (such as using the same cell-growing techniques as shown here to develop organs to replace ones damaged by trauma or disease) or in the more questionable directions in which it could possibly go. It also highlights both the inescapable similarities and inequities in humans' relationship with their animal Others: we are intricately interconnected organisms sharing the same planet and ecosystems, and far more similar than once thought (a fact that recent genome mapping highlights even more than the Darwinian theories cited above by Freud), yet humans' interaction with other animals is almost exclusively exploitative (and rarely questioned).

The project would seem resolutely posthuman, but it is perhaps fitting that, given posthumanism's rejection of fixed and impermeable boundaries, *Victimless Leather* is not without its humanist influences and overtones. The piece was, after all, displayed at MoMA as part of their Design and the Elastic Mind show, which celebrated technologically-aided design to improve human life. Even more strikingly, *Victimless Leather* achieves the ultimate dream of Renaissance humanist art: the actual reproduction of nature, not merely via a convincing simulation, but by displaying the very process of created and artistically altered life. This display of life in an art museum ended up creating an unusual dilemma for MoMA's curators when the cells of the project, designed as they were to "grow indefinitely," did just that. When the project's rapidly multiplying cells began to clog its incubator, and one of the jacket's sleeves began to fall off, senior curator Paola Antonelli was forced to flip the switch, as described in a *New York Times* article provocatively headlined "Museum Kills Live Exhibit." Antonelli reports, "I felt

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space of our touch, our subjectivity-in-process. Touch as a reaching toward is a gesture of /espacement/, and instance of the inexorable violence of difference, of the unknowable. Touch is a movement toward an other through which I re-cognize myself differently, spacing time as I time space." (60)

cruel when I turned it off. It was the only piece in the show that was alive."[285] Catts, on the other hand, was quite satisfied with the outcome and emotional reaction. He stated that he "particularly liked what happened at the MoMA [sic]," stating that the need for the shutdown fit with the group's desire "to present the end of our projects in ways that remind people that these works are/were alive and that we have a responsibility towards the living systems that we engage in manipulating."[286]

The small ritual of death at the museum, combined with what the *NYT* reporter called the sculpture's "unsettlingly alive"[287] appearance beforehand, reveals the discomfort prompted by the presence of something that straddles the gap between living and inanimate—as well as the appearance of skin itself: real, simulated, or simulacrum.[288] *Victimless Leather*, with its semi-living cells that are neither skin, leather, nor victimless,[289] nonetheless reads as strikingly animal, if not quite human. One doubts whether Antonelli would have felt as much empathy and subsequent "cruelty" had the project been floral rather than faunal, and in particular had it not had that pinkish, flesh-like glow.

The rosy hue of flesh comes, however, from the blood that courses through it, blood that has never infused this Semi-Living Sculpture.[290] In fact, *Victimless Leather*'s

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[285] Schwartz, John. "Museum Kills Live Exhibit." *New York Times*, 5/13/08.
[286] Ibid.
[287] Ibid.
[288] I would suggest that in a Baudrillardian sense, *Victimless Leather*, never really skin nor victimless, and thus referring only to a non-existent imaginary, is the latter.
[289] The nutrient media solution used to feed the cells, as is typical in tissue culture, was composed primarily of animal products such as "foetal calf serum" (http://www.tca.uwa.edu.au/publication/ia6_2_transvergence_catts_zurr_extendedbody.pdf). In an earlier project, *Disembodied Cuisine*, in which Catts and Zurr cultured tissue for consumption as food, one estimate placed the ratio at one calf per 100 grams of "victimless" meat. (http://c-lab.co.uk/default.aspx?id=8)
[290] This lack of vascularization is what the artists call "the main barrier to achieving a large-scale tissue-engineered sculpture" (such as a full-scale leather jacket) due to "the lack of an internal plumbing system" that can effectively transport nutrients and dispose of waste. Were such possible, they continue that "the

bloodlessness is perhaps the quality that makes it most alien, and most differentiates it from Orlan's skin. In Shakespeare's *The Merchant of Venice*, protagonist Antonio escapes having the amount of his debt subtracted from his person in the form of his own flesh on a technicality: the earlier deal with the vengeful Shylock made no provision for the former's blood, without which extraction of the flesh is impossible. In a prior scene that foreshadows this denouement, the tormented moneylender, justifying the extreme terms of this contract, relates the persecution he has suffered at Antonio's hands—simply because, Shylock states, "I am a Jew." He continues passionately, "Hath not a Jew eyes? hath not a Jew hands, organs, dimensions, senses, affections, passions? fed with the same food, hurt with the same weapons, subject to the same diseases, healed by the same means, warmed and cooled by the same winter and summer, as a Christian is?"[291] Shylock appeals to a sense of shared humanity that is embodied, and particularly related to organs of sensation and to the ability to feel. He continues, "If you prick us, do we not bleed?" Skin is the unspoken unifier in his diatribe: receptive (touch, in more ways than one, the common sense Anzieu describes); vulnerable; and an individual, yet universal, boundary with a shared fragility. Two hundred years before Kant theorizes a universal subjectivity based on a shared experience of the aesthetic, Shakespeare's Shylock, from a position of low social standing, makes an eloquent plea for subjectivity based on something much more immediate and intimate: the skin.

Pricked, Orlan does bleed. Not entirely dissimilar in color and texture to *Victimless Leather*, her skin also becomes object: no longer self, or face, but medium. Watching her

development of a capillary system would also facilitate the creation of a living barrier—a skin—to protect the sculptures from harmful agents in the environment." ("Growing Semi-Living…", p. 369)

[291] William Shakespeare, *The Merchant of Venice,* Terrentenary Edition (New York: Marlowe Press Inc, 1916), 46.

skin open under the surgeon's scalpel, however, produces an effect that is less alienating than entangling. Orlan is not cyborg, but consummately human: bleeding, she is so human that we cannot help but feel the pain she claims to avoid. Orlan's rather cavalier attitude about the pain, after the fact, may align with the photographic record, but not with the video. Although she continues to speak and answer questions throughout the surgical procedure, it is clear—visibly as well as empathically—that she is indeed suffering.

During *Omniprésence,* art and cinema critic Jean-Paul Fargier, speaking via live uplink, makes a connection to another image of suffering designed to provoke a visceral reaction, one not entirely uninvited by Orlan's earlier oeuvre: "You identify with the Holy Face. That's all you had left to do: become a suffering body." Orlan quickly corrects him: "My body is operated on—it's not suffering." Fargier, still concentrating upon religious imagery, and anxious to assert his point, responds, "We suffer to see the needles. What's interesting is, you're killing yourself in public, disappearing, reappearing, a sort of resurrection. You're trying to attain immortality while you're alive."[292] Although Fargier insists upon offering his own interpretation of the piece, he is certainly correct that the audience "suffers to see the needles"—though not because it reminds them of a religious icon of suffering, but because of the *humanity* they share with the artist. This visceral reaction is not merely an intellectual empathy, but a bodily-experienced sense of the deeply uncanny, not absent a certain revulsion at seeing Orlan's body open and oozing.

[292] Carnal Art video, 2002.

Orlan is well aware of the effect the images of her surgeries have on viewers, though she insists that she doesn't experience any more pain watching them than she did during the procedures. In the text of her "Conference," she writes:

> A few words more on these images that you will probably watch with discomfort. Sorry to have to make you suffer, but know that I do not suffer—unlike you—when I watch these images. Few images force us to close our eyes: death, suffering, the opening of the body, certain aspects of pornography (for certain people), or for others, birth. Here the eyes become black holes into which the image is absorbed willingly or by force. These images plunge in and strike directly where it hurts, without passing through the habitual filters, as if the eyes no longer had any connection with the brain. When watching these images. I suggest that you do what you probably do when you watch the news on television. It is a question of not letting yourself be affected by the images, and of continuing to reflect upon what is behind them.

The images do penetrate, and though they enter the brain through the eyes—whose filtering capabilities, Orlan suggests, viewers use—they are felt in the skin. There is no Kantian distancing here: the shared reality of skin, and the experience of it as self, establishes an emphatic empathic connection.

Indeed, recent discoveries in neuroscience have suggested fascinating (if not yet entirely understood) insights into empathy, based on brain activity. In the mid-1990s, research on macaque monkeys revealed the presence of what the researchers called "mirror neurons," which fired when the monkeys performed certain actions, as well as when they saw others do so. Although it has not been possible to locate these neurons in humans, neuroscientists refer to the "human mirror neuron system," which seems to function in similar ways and may be related to language and social communication.[293] More recently, these innate reactions have also been shown in functional magnetic resonance imaging (fMRI) studies, in which brain centers activated by one's own pain are

[293] Jeanine M. Vivona, "Leaping From Brain to Mind: A Critique of Mirror Neuron Explanations of Countertransference," *Journal of the American Psychoanalytic Association* 57, no. 3 (June 2009): 525-550.

also activated by witnessing the pain of others.[294] Scientists tend to consider this capacity for recognizing another's emotional or physical distress key for survival, and thus an important evolutionary and social development. Our innate orientation toward feeling others' pain is in overdrive when we experience the slicing of Orlan's skin.

Conclusion

The shared sense of skin that makes it impossible for viewers to avoid the pain Orlan claims not to feel is the crux of the piece, and demonstrates the failure that makes it successful. Orlan's rhetoric about the body being obsolete, an ill-fitting costume, and modifiable (along, ostensibly, with the self) through contemporary medical technology, appears patently false in the light of her actual surgeries (fig. 39). In addition, the "plan" for the project bears little resemblance to the final product—and Orlan's features, little, if any, resemblance to their art historical models. The large nose Orlan sought seems to have been proven an impossibility and abandoned.

Yet Orlan's project is most valuable for what it imagines: a posthuman figure freed from the constraints of the given human body; cyborgically integrated with technology; and unfinished, in flux. Her work with textiles and costumes foregrounds the materiality of her skin when she turns to it as an artistic medium, yet the self-ness of the skin argued by Anzieu and Serres makes it much more than the costume Orlan suggests. In fact, the decision to open the skin, the tension of which the video captures so well in spite of

[294] See, among others, Tania Singer, et. al, "Empathy for Pain Involves the Affective but not Sensory Components of Pain," *Science* 303, no. 5661 (February 2004): 1157-1162, doi: 10.1126/science.1093535 and See Philip L. Jackson, et. al, "How Do We Perceive the Pain of Others? A Window Into the Neural Processes Involved in Empathy," in *NeuroImage* 24, no. 3 (August 2004): doi: 10.1016.j.neuroimage.2004.09.006. This last phrase evokes the title of Susan Sontag's 2003 book, *Regarding the Pain of Others* (New York, Picador), which focuses specifically on photographs of war, and our conflicted relationship with them. The nature of these images, with their sheer volume and widely varied presentations (and audiences), meant that, alas, despite its seductive title, the book was able to shed little light on my specific questions here.

Orlan's brave face and bluster, evokes a Marsyan separation of self from self, making hers not only a posthuman, but a sovereign gesture.. This is not, however, a Cartesian commanding of the body by the soul—a reinforcement of the idea of the body as merely a vehicle at the whim of its steersman. The opening Orlan undertakes is ultimately one of a body inseparable from soul, or, to use a more cyborgian metaphor, hardware and software together. The space opened as her skin is lifted demands, in the light of her rhetoric, the imagination of a posthuman figure whose body can be modified like machinery, through a seamless interface with technology. This vision of the skin is one far different from Early Modern conceptions of a permeable, expressive skin, or a modern one in which skin is the boundary and protection of a single, rational, self-contained subject. I have argued that as such, this latter understanding of skin is emblematic of humanist subjecthood as imagined through the concept of the aesthetic, in which shared subjecthood is possible through an experience of embodiment necessarily mediated and rationalized by distance. Yet empathy, in *Blade Runner* a uniquely human quality, is also located in the skin, linking subjects more intimately than even an embodied understanding of the aesthetic does. Liberal humanist tendencies of distancing nonetheless remain, and Catts and Zurr's *Victimless Leather* highlights these networks of exchange and domination, while envisioning yet another kind of posthuman skin: this one a fusion of human and animal cells, eerily alive, and with its sci-fi mise-en-scene, a vision of a certain imagined posthuman future. This skin, however, unbinding and unbound, is also bloodless—perhaps the greatest reason we feel little sorrow at its "death," while watching Orlan's skin open causes an almost physical distress.

On her website, Orlan has posted a "Petition Against Death" that she invites visitors to sign. The text reads:

> ENOUGH IS ENOUGH !
> It's been going on way too long !
> It must stop !
> I don't agree, I don't want to die !
> I don't want my friends to die
> It's time to react against death.
> Let's try all together, we must have a chance.
> Yes, it is possible to have chance, if you say : No !
> If you write here : No !
> Together, with no exception[295]

As an action intended to reverse the inevitability of death—by, of all things, an Internet petition—this performance is doomed to certain failure. It brings into being a world in which death is something to be stopped: something that has been wreaking havoc for too long and can be ended by emphatic community action—a world at odds with the posthuman perspective Hayles argues for, one that "recognizes and celebrates finitude as a condition of human being, and that understands human life is embedded in a material world of great complexity, one on which we depend for our continued survival."[296] It ensures its own failure. Likewise, Orlan's surgical performances to reinvent the self or to display the obsolescence of the body perform their own failure. Although I have argued that Orlan's project is distinctly posthuman in its imagining and presentation of an unfixed, modifiable, technologically-mingled self, hers is also, to borrow from another of Cary Wolfe's beloved matrices, whether intentionally or not, a very *humanist* posthumanism.[297] *Omniprésence* is effective because it allows us to imagine this

[295] www.orlan.net
[296] *How We Became Posthuman*, p. 5.
[297] Cary Wolfe, *What is Posthumanism?* (Minneapolis: University of Minnesota Press, 2010), p. 125.

posthumanist figure, while seeing, and feeling as if in our own skin, an inexorably human sense of entanglement, and what that entanglement could mean.

APPENDIX I

Orlan, *Manifesto of Carnal Art*

DEFINITION
Carnal Art is self-portraiture in the classical sense, but realised through the possibility of technology. It swings between defiguration and refiguration. Its inscription in the flesh is a function of our age. The body has become a "modified ready-made", no longer seen as the ideal it once represented ;the body is not anymore this ideal ready-made it was satisfaying to sign.

DISTINCTION
As distinct from "Body Art", Carnal Art does not conceive of pain as redemptive or as a source of purification. Carnal Art is not interested in the plastic-surgery result, but in the process of surgery, the spectacle and discourse of the modified body which has become the place of a public debate.

ATHEISM
Carnal Art does not inherit the Christian Tradition, it resists it! Carnal Art illuminates the Christian denial of body-pleasure and exposes its weakness in the face of scientific discovery. Carnal Art repudiates the tradition of suffering and martyrdom, replacing rather than removing, enhancing rather than diminishing – Carnal Art is not self-mutilation.

Carnal Art transforms the body into language, reversing the biblical idea of the word made flesh ; the flesh is made word. Only the voice of Orlan remains unchanged. The artist works on representation.

Carnal Art finds the acceptance of the agony of childbirth to be anachronistic and ridiculous. Like Artaud, it rejects the mercy of God -Henceforth we shall have epidurals, local anaesthetics and multiple analgesics ! (Hurray for the morphine !) Vive la morphine ! (down with the pain !) A bas la douleur !

PERCEPTION
I can observe my own body cut open without suffering !….I can see myself all the way down to my viscera, a new stage of gaze. "I can see to the heart of my lover and it's splendid design has nothing to do with symbolics mannered usually drawn.
Darling, I love your spleen, I love your liver, I adore your pancreas and the line of your femur excites me.

FREEDOM
Carnal Art asserts the individual independence of the artist. In that sense it resists givens and dictats. This is why it has engaged the social, the media, (where it disrupts received ideas and cause scandal), and will even reached as far as the judiciary (to change the Orlan's name).

CLARIFICATION

Carnal Art is not against aesthetic surgery, but against the standards that pervade it, particularly, in relation to the female body, but also to the male body. Carnal Art must be feminist, it is necessary. Carnal Art is not only engages in aesthetic surgery, but also in developments in medicine and biology questioning the status of the body and posing ethical problems.

STYLE

Carnal Art loves parody and the baroque, the grotesque and the extreme.
Carnal Art opposes the conventions that exercise constraint on the human body and the work of art.
Carnal Art is anti-formalist and anti-conformist.

Figure 2.1 Orlan, *Omniprésence*, 1993.

Figure 2.2 Orlan, *Omniprésence*, 1993.

Figure 2.3 ***Imaginary Generic No. 31: Successful Operation(s)*****: det.: Orlan posing. 1990.**

Figure 2.4 Orlan*, Orlan accouche d'elle-m'aime* (Orlan Gives Birth to her Loved Self), 1964.

Figure 2.5 Orlan, MesuRage of Rue Châteaubriant, Nice, 1976.

Figure 2.6 Orlan, *La Baiser de l'artiste,* 1977.

Figure 2.7 Orlan, *La Baiser de L'artiste.* Sculpture and pedestal. 1977.1977

Figure 2.8 Orlan, Strip-tease occasionnel à l'aide des draps du trousseau), 1974-1975.

Figure 2.9 Orlan, Madone en demonte-pneu, en assomption sur verin pneumatique, 1990.

Figure 2.10 Orlan, *Peau d'âne (Donkey Skin)*, 1990

Figure 2.11 Charles Perrault, director, *Donkey Skin* (film still). 1970.

Figure 2.12 From left to right: François Boucher, The Rape of Europa, 1747 (detail); Workshop of André-Charlemagne Charron, tapestry after Boucher's design, 1754-1770 (photograph; detail); "Europa" detail from Orlan's Imaginary Generic.

Figure 2.13 Orlan, *Art Charnel (*Carnal Art), July 1990.

Figure 2.14 Orlan, *Tableaux Vivant,* 1978.

Figure 2.15 Orlan, S'habbiler de sa proper nudité (Dressed in Her Own Nudity), 1976-7.

Figure 2.16 Orlan, *Operation Reussie* (video capture), 1991

Figure 2.17 Orlan, *Warranted Pure Orlan*.

Figure 2.18 Orlan, Operation Opera, 1991.

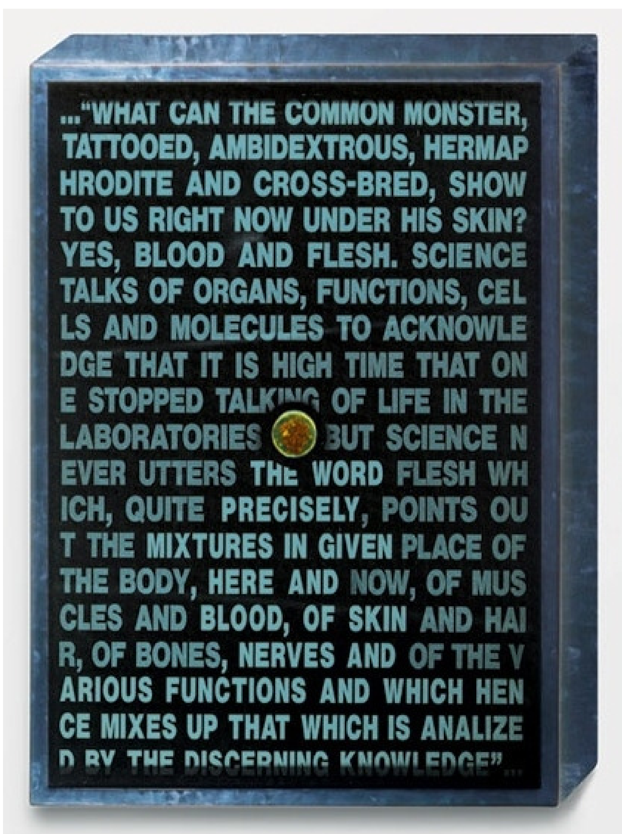

Figure 2.19 Grand reliquaire, "My Flesh, the Text, and Languages," No. 10. English.

Figure 2.20 Orlan, Sixth Surgery-Performance. "Posing with skulls and trident" and "Printing lips on paper." 1992.

Figure 2.21 Orlan, "Portrait of Orlan in the Operating Theater Prior to the Operation." Omniprésence, 1993.

Figure 2.22 Orlan, *Omniprésence*, 1993.

Figure 2.23 Orlan, Omniprésence, 1993.

Figure 2.24 Orlan, Omniprésence, 1993. Video still.

Figure 2.25 Orlan, Omniprésence, 1993. Video still.

Figure 2.26 Orlan, *Omniprésence*, 1993*.*

Figure 2.28 Orlan, 9th Surgery-Performance, 1993.


Figure 2.27 Orlan, Photograph Produced by the Body-Machine Four Days After the Performance. 1993.

Figure 2.29 Orlan, Omniprésence Nº 2, 1994. Installation view, Centre-Georges Pompidou.

Figure 2.30 Orlan, *Official Portrait after Leaving Quarantine*. Final image from *Omnipresence: No. 1* (1993).

Figure 2.31 Juseppe de Ribera, *Apollo Flaying Marsyas*, 1637.

Figure 2.32 ***Laocoön Group*** **(Roman copy), 1st c. CE after early 2nd c. BCE Pergamene original. Vatican Museum. ArtStor.**

Figure 2.33 Orlan, from www.orlan.net, 2005.

Figure 2.34 Small Reliquary, "This is my body... this is my software," 1992.

Figure 2.35 Sebastian (left), with Replicants Pris (center) and Roy Batty. *Blade Runner* (1982).

Figure 2.36 Pris reaches into a boiling beaker. *Blade Runner* (1982).

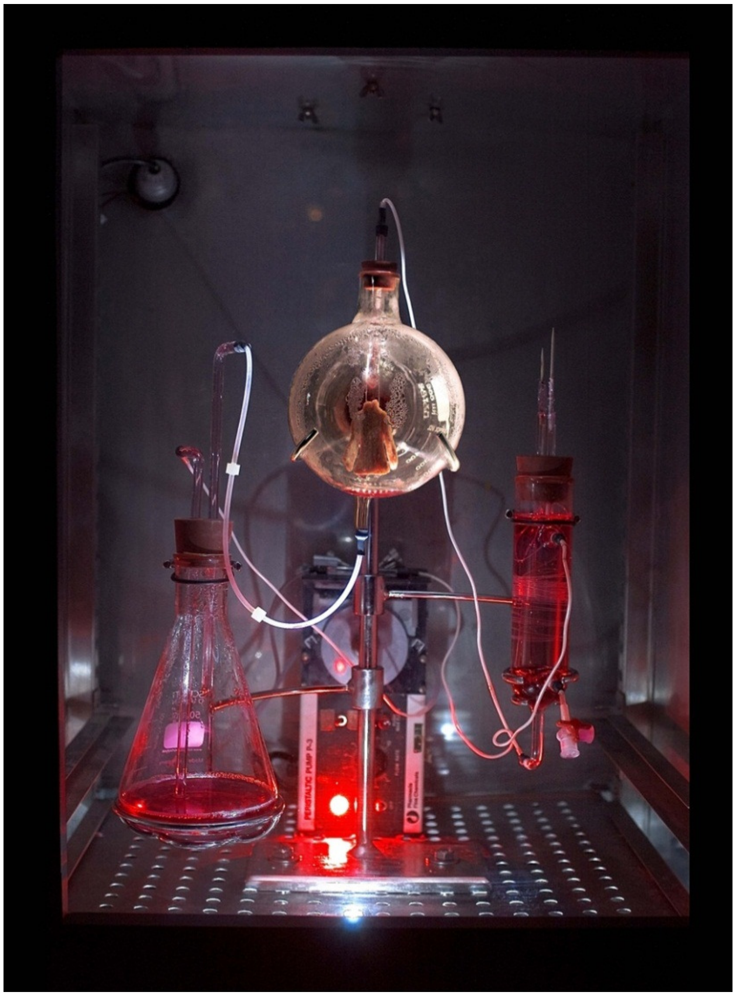

Figure 2.37 Oron Catts and Ionat Zurr, Victimless Leather—A Prototype of Stitch-less Jacket Grown in a Technoscientific Body. 2004.

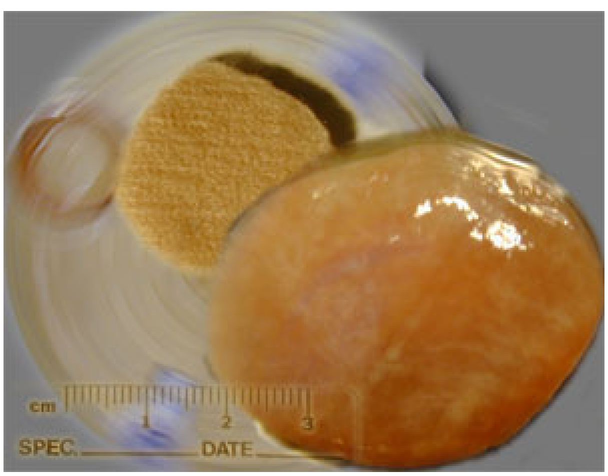

Figure 2.38 Oron Catts and Ionat Zurr, Study for *Disembodied Cuisine*, 2003.

Figure 2.39 Orlan, ***Piece a conviction (Courtroom Exhibit):*** **Costume for the Seventh Surgery-Performance. Translator Sophy Thompson's costme. 1993.**

"Yet still I'm a cyborg just like you/I am one big myoma that thinks
My planet supports only me/I've got this one big problem
Will I live forever? I've got just a short time you see
Modern man, evolutionary betrayer/modern man, ecosystem destroyer"—Bad Religion[298]

Chapter 3 : *Immersion*

Introduction

In the bleak dystopia of William Gibson's 1984 *Neuromancer*, mind and body are data and meat: the former uploaded, downloaded, or translated across media, and the latter upgraded with fragments of "microsoft" inserted into skull sockets or customized with physical modifications for aesthetics or performance. The novel's protagonist, Case, is a "console cowboy," a skilled hacker most at home in Cyberspace, the name Gibson invents to describe the vast networked realm where the world's digital data is navigable in graphical form.[299] Case enters this space by "jack[ing] into a custom cyberspace deck that project[s] his disembodied consciousness into the consensual hallucination that [is] the matrix."[300] Connected to the matrix via "dermatrodes" at his temples, he maintains a link to the physical world as he runs codes and viruses through the deck at his fingertips. Yet with full neural integration into the matrix, he experiences both "the bodiless exultation of cyberspace"[301] and well as the real threat of physical braindeath inside it.

Gibson's descriptions of Cyberspace itself are sparse, impressionistic sketches of a space "with its roots in primitive arcade games,…in early graphics programs and military experimentation with cranial jacks…. Lines of light ranged in the nonspace of the mind,

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[298] Greg Graffin. From the album *Against the Grain* (Epitaph: 1990).
[299] Since cyberspace has by now become an integral part of the lexicon, for clarity I have chosen to capitalize it when referring to the virtual world of *Neuromancer.*
[300] (New York: Ace Books, 1984), 5.
[301] Ibid, 6

clusters and constellations of data. Like city lights, receding…"[302] The most evocative passage describes Case's first reentry into the matrix after having surgery to repair neural damage inflicted by a former employer he had robbed:

> He closed his eyes.
> Found the ridged face of the power stud.
> And in the bloodlit dark behind his eyes, silver phosphenes boiling in from the edge of space, hypnagogic images jerking past like film compiled from random frames. Symbols, figures, faces, a blurred, fragmented mandala of visual information.
> Please, he prayed, *now*—
> A gray disk, the color of the Chiba sky.
> Now—
> Disk beginning to rotate, faster, becoming a sphere of paler gray.
> Expanding—
> And flowed, flowered for him, fluid neon origami trick, the unfolding of his distanceless home, his country, transparent 3D chessboard extending to infinity. Inner eye opening to the stepped scarlet pyramid of the Eastern Seaboard Fission Authority burning beyond the green cubes of Mitsubishi Bank of America, and high and very far away he saw the spiral arms of military systems, forever beyond his reach.[303]

The language describes a nearly orgasmic physical sensation, but cyberspace itself is depicted in strictly geometric terms, here and elsewhere: cubes and pyramids, protected with security "ice," all set against the matrix's Cartesian grid. Case's body is only the vaguest of shadows: "And somewhere he was laughing, in a white-painted loft, distant fingers caressing the deck, tears of release streaking is face."[304] The body fades into a barely perceptible background, the mind blissfully absorbed in the virtual world.

This digital realm, which can absorb the mind as well as impact the body, is vividly depicted in the 1999 film *The Matrix*,[305] which takes its title, as well as much of its imagery, from *Neuromancer*. The opening scenes bring to life the "symbols, figures…

[302] Ibid, 51
[303] Ibid, 52
[304] Ibid.
[305] Directed by Larry and Andy Wachowski. (Los Angeles, CA: Warner Bros., 1999).

[and] fragmented mandala of visual information" that Case sees as he enters Cyberspace, here in the form of acid green characters rolling and shimmering down a black screen. The film describes the Matrix as "a neural interactive simulation"—a construct that represents the "reality" experienced by those who haven't been "unplugged"—but it is also visible from the outside in this encoded form. When the protagonist Neo asks one of the operators, watching the glowing gibberish (fig. 1), if he always looks at it encoded, the operator replies, "Well, you have to. The image translators work *for* the construct program. But there's way too much information to decode the Matrix. You get used to it. I…I don't even see the code. All I see is blonde, brunette, redhead..." Although the entirety of the data required to run a convincing reality construct is vast, the scrolling screens of code make it clear that "reality" is simply an elaborate piece of software.

The interface of *The Matrix* further emphasizes the idea of a seamless transmissibility between body and machine, the real and the virtual. In contrast to the dermatrodes that Case straps on, Neo's connection to virtuality is effected via a long metal probe that fits a socket at the base of his cranium. Experiences in the Matrix also have repercussions in the physical world; when Neo returns to reality after plummeting to the virtual ground in a failed jump, he's sore and has real blood in his mouth. "I thought it wasn't real," he winces. "Your mind makes it real," his mentor, Morpheus, explains. Neo clarifies, "If you're killed in the Matrix, you die here?" Morpheus responds enigmatically, "The body cannot live without the mind." As the film later reveals, a body unplugged while the mind is in the Matrix also dies in both worlds; the metaphor here might be a catastrophic crash of both software and hardware.

Neal Stephenson's *Snow Crash,* published in 1992*,* is a third imagining of the body in virtual reality, and, as its title suggests, depicts just that sort of catastrophic crash.[306] Unlike *Neuromancer* and *The Matrix*, Stephenson's virtual sphere, which he dubs the Metaverse, is accessed not neurally, but through external stimulation: earphone-equipped goggles, onto which one's computer projects a high-resolution laser image for an immersive 3D effect. A fisheye lens tracks the user's gaze to facilitate navigation of the virtual world and translates facial expressions to his or her avatar,[307] which might be a generic off-the-rack model, or, in the case of skilled programmers such as the eponymous Hiro Protagonist, highly personalized and lifelike. Less an abstract data repository or nefarious illusion than an entertaining parallel of the physical world, the Metaverse is also less invasive and more egalitarian than cyberspace or the Matrix: access requires no more than a sufficiently powerful computer, including ones publically available.

"Dying" in the Metaverse poses no particular risk, as users aren't neurally linked to the matrix; the user is simply booted offline while programs dispose of the avatar in question, and after a few moments the user can "goggle in" again. However, the titular Snow Crash is a drug, or perhaps virus, that moves, unexpectedly, between computer and mind. In the Metaverse, a shifty character offers Hiro the drug in the form of a "hypercard," a visual representation of transferable data:

> If Hiro reaches out and takes the hypercard, then the data it represents will be transferred from this guy's system into Hiro's computer. Hiro, naturally, wouldn't touch it under any circumstances, any more than you

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306 (London: Penguin Books, 1992).

307 Stephenson describes the Metaverse, and particularly avatars, in ways that highlight the then relative radicality of the idea: "He is not seeing real people, of course. This is all a part of the moving illustration drawn by his computer according to specifications coming down the fiber-optic cable. The people are pieces of software called avatars. They are the audiovisual bodies that people use to communicate with each other in the Metaverse." (33) Today, avatars are a familiar concept, as is the idea of interaction in virtual spaces.

> would take a free syringe from a stranger in Times Square and jab it into your neck.
>
> And it doesn't make sense anyway. "That's a hypercard. I thought you said Snow Crash was a drug," Hiro says, now totally nonplussed.
>
> "It is," the guy says. "Try it."
>
> "Does it fuck up your brain?" Hiro says. "Or your computer?"
>
> "Both. Neither. What's the difference?"
>
> Hiro finally realizes that he has just wasted sixty seconds of his life having a meaningless conversation with a paranoid schizophrenic. He turns around and goes into The Black Sun.[308]

As it happens, the pusher's description was neither paranoid nor schizophrenic, which becomes obvious inside the Black Sun, when Da5id, Hiro's fellow hacker and the bar's proprietor, samples the Snow Crash. "I've got so much antiviral medicine in my system that nothing could get through," Da5id boasts, yet moments later, exposed to the data from the card, he dissolves into a spectacular cloud of digital noise. More troublingly, he ends up convulsing and babbling in a Reality hospital, his heart and mind both apparently scrambled by the digital virus. In *Snow Crash*, this rogue program is not transmitted directly into Da5id's neurons, but enters his eyes as code that his programming background allows him to internalize: his body's "hardware" processes software that crashes not just his computer but his body.

Cyberspace, the Matrix, and the Metaverse, despite their differences, share the vision of virtual worlds that completely immerse the participant, allowing interaction between multiple entities on a global scale and near-complete dissociation from the physical world. They also frame the human mind as extensible into the digital realm: thoughts merely data, personalities transferable constructs, and the body just another form of hardware. Given this extensibility, the body is essentially abandoned in the physical world, an old-fashioned token with arcane and inconvenient demands—the "prison of his

[308] Stephenson, 41

own flesh" that Case feels when he is neurally prevented from accessing Cyberspace.[309] In *Neuromancer,* the body outside of Cyberspace is "meat," with the attendant "meat needs" that Case disdains.

In the 1980s and '90s, technological development began to bring the idea of computer-generated worlds, dubbed Virtual Reality (VR), from fantasy to reality. These projects tended to have the *Neuromancer*ian aesthetic of hard-edged polygons emerging from an inky background[310] and to be navigated using a "goggles and glove" interface underscoring a Cartesian notion of control. Yet the projects that represent the pinnacle of this technology were spearheaded by a Canadian painter and digital artist, Char Davies: the highly sophisticated *Omsose* (produced by the Softimage corporation in 1995) and *Ephémère* (coproduced by Softimage and Davies' Immersence, Inc. in 1998). These projects replace rigid geometric forms with layers of transparent color to evoke a full and almost pulsating space, and feature an interface that emphasizes embodiment. The virtual world is entered via a head-mounted display (HMD) with stereophonic audio, while a vest measures the "immersant's" breathing and location in space to facilitate navigation of the digital environment.[311] There is neither glove nor other manual motion control, thwarting the traditional video game desires for speed, action, and accomplishment of tasks. With these projects, Davies insists that she is using the technology subversively, working from within the system to challenge it.

Yet this is just one of many contradictions in these fascinating pieces. Although *Osmose* and *Ephémère* were created with what at the time was cutting-edge technology,

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[309] Gibson, 6.
[310] The Metaverse, too, is described as springing from black emptiness. Although it is populated with brightly-lit structures, its sky remains black, making it permanently night on the Street.
[311] Throughout this chapter, I will use Davies' term immersant to refer to those who, donning the HMD and vest, enter the digital worlds of *Osmose* and *Ephémère.*

Davies' rhetoric about them echoes much older philosophies of the body and femininity. Intended to immerse the user in an entirely computer-generated space, they shape a very specific experience of technology (as the non-Real) and the body (as entirely natural and discrete from technology). Whereas the digital spaces Gibson and Stephenson imagine are arenas of agency, connection, and possibility, *Osmose* and *Ephémère* are solitary ones, private personal immersions disconnected from a larger web of digital information and movement. Viewing the two pieces today is not the overwhelming experience of transcendence described by so many early immersants. Instead, the HMD, grainy liquid crystal display (LCD) screen, and low-resolution graphics provide a stark contrast to the seamless digital imagery so ubiquitous in the contemporary visual milieu. Although Davies' groundbreaking interface remains unique, it is clear why: it is cumbersome, exhausting, prone to breakdown, and expensive—even more so than more traditional VR interfaces, which, like the technology they facilitated, were largely abandoned in the mid-1990s.

In *How We Became Posthuman*, Katherine Hayles argues that contemporary (posthuman) understandings of our relationship to technology, shaped by science and science fiction, imagine the body as merely a vehicle for the mind—which, like computer software, is simply data, transmissible across multiple platforms. This is the vision of *Neuromancer*, *The Matrix*, and *Snow Crash*. Davies' projects seem to solve this divide by bringing the body, as fully and literally as possible, into the computer. Yet unlike the productive blurring of boundaries suggested by posthumanism, as explored in the previous two chapters, I argue that Davies' projects, for all their ambiguous imagery, instead tend to reinforce binaries. Davies' rhetoric draws sharp divisions between the "masculine" spaces of most VR and her own "feminine sensibility," and between an untainted, Edenic Nature/ "real" Real and the poor simulation of the machine. Although the "embodied interface" these pieces offer would bring the body into technology, it ends up reinforcing and insisting upon the distance between them. Perhaps most strikingly, when viewed against today's entertainment and communications technology, the pieces offer an experience of the virtual that is extraordinarily limited, not just by their low-fi graphics and cumbersome interface, but by their insularity. Today's posthuman experience of technology is, perhaps ironically, closer to science fiction than to the safe, limited, tethered experience of virtuality offered by *Osmose* and *Ephémère*.

My goal in this chapter is to place Davies' two projects—as exemplars of a certain kind of VR technology—in conversation with more contemporary experiences of the digital world, and thus to recognize better and understand that posthuman experience. I argue that this experience is one characterized by an immersion in the virtual that isn't dependent on cumbersome interfaces, but that is more subtle and more pervasive than the "safe," bounded experience offered by Davies' pieces. Comparing the version of living in the future represented by these projects with today's experience of future-living allows us to see the contours and potentials of our posthuman milieu. Although they are, by modern standards, fairly old, Davies' projects feel outdated not, primarily, because of their technology, but again, because of the binarism on which they insist. Even the involved process of "suiting up" reinforces perceived between body and machine, the real and the virtual—the necessary requirements of a journey to a *different* space. Today, one is far more likely to slip into absorption—momentarily or for prolonged periods—in one of the ubiquitous two-dimensional screens that surround us, whether televisions, computers, or phones (the distinctions between which continue to narrow relentlessly). The contemporary experience of the virtual is of its pervasiveness: its ability to augment, rather than reproduce, reality. Precisely because this experience of the “virtual” is porous to the broader “real” world, there tend to be fewer disorienting slippages between the two than in the earlier equipment that mandated full encapsulation as a requirement for suspension of disbelief (and was thus doomed to fail). There is also less need to theorize the events experienced in virtuality as being either entirely divorced from “reality” (i.e., “what happens in virtuality, stays in virtuality”) or needing to be actively transported back into “real” life.

In this chapter, I explore this changing experience by first considering VR, both in popular imagination and in technological actuality, during the year that likely represented the medium’s peak: 1994. I provide a short history of the developments that led to that point in order to contextualize *Osmose* and *Ephémère* and to situate the accomplishments that set them apart in the genre, in particular their unique user interface. I dwell on another artistic VR project, 1993’s *Placeholder*, that not only featured individuals Davies would later employ, but foreshadowed similar concerns she addresses in her projects—about embodiment, nature, and different possibilities for VR’s future. I look at the conditions of the creation of *Osmose* and *Ephémère* (which differed significantly and notably from *Placeholder*’s), the quasi-mythical reputation they have achieved, and the way that this status works to shape perceptions and imaginings of the “immersion” experience. I draw on my own experience of traveling to view *Osmose* and *Ephémère* in the artist’s studio to explore the effect of “immersion” in the pieces a decade and a half after their creation. Finally, I examine what these pieces tell us about our posthuman present in light of the technology—notably that by now-ubiquitous Cyberspace/Metaverse/Matrix/Internet—that has succeeded them.

Nineteen ninety-four

On February 3, 1994, the situational comedy *Mad About You* aired the episode "Virtual Reality," in which the main characters Paul and Jamie consider investing in a cutting edge VR system that offers an extensive menu of shockingly realistic immersive experiences.[312] The episode captures the myth of VR—fully interactive, customizable, hyperrealistic digital experiences—while also exploring the implications of what might happen, or be perceived to happen, within that virtual world. This "Cybercinetic" VR system, developed by a precocious 14-year old who also teaches at Columbia, is described as the wave of the future. Its young developer extols its interactive capabilities: "With this you create your own cyberspace. The picture and the sound are fully digital. And plus, it offers a menu of over a thousand pre-programmed images that you're able to interact with."

Paul, preparing to experience the system for the first time, sits in a dentist-style chair in an austere white room as the kid loads a digital image of him into the attached computer (fig. 2). Paul's friend Ira, who has persuaded him to check out the investment opportunity ("You remember Janet Leigh in *Psycho*?… You remember the first time you saw the 'co-ops' on her?…Well, with Virtual Reality, I'm telling you, it's like you could actually touch them!"), helps Paul into the HMD as he pulls on the glove. Ira directs Paul's ungloved left hand toward the keyboard to select his scenario and the audience sees the garishly-colored screen of options, which Paul ponders only briefly before

[312] Danny Jacobson, "Virtual Reality," *Mad About You*, season 2, episode 15, directed by Thomas Schlamme and David Steinberg, aired Feburary 3, 1994 (Culver City, CA: Sony Pictures Home Entertainment, 2003), DVD.

clicking on “Brinkley, Christie” (fig. 3). As he clicks, the scene fades and pixelates, resolving into a shot of Paul sitting at a bus stop against a cartoonlike backdrop. A tall blonde enters, clad in black lingerie and, theatrically propping her foot on the bench, sultrily declares that her garter belt has given her an itch that Paul should scratch. As he acquiesces (his real-world speech seamlessly intelligible in the virtual one), the scene cuts to the humorously gadgetry-bedecked Paul, grinning sloppily as he mimes the motions—touching nothing, but clearly experiencing the sensations in virtuality. Throughout the subsequent scenarios, which involve Paul rubbing tanning oil on Christie’s back at the beach, and her rubbing his shoulders on a rug in front of the fire, he makes asides to the others, who are apparently also able to see and hear what is transpiring in the virtual world.[313]

When he describes the VR system to Jamie, Paul extols the virtues of its realism and interactivity, emphasizing its difference from a mere video game, as Jamie has dismissed it. “Everything you do, it’s like you’re doing it!” he says. “You’re right there, you’re doing it!” When Paul is forced to admit just what he experienced with such simulated proximity, his claim that “I didn’t do anything! I *virtually* did it!” falls on deaf ears, as does his now-ironic defense, “It’s a *video game*!”

When Paul prevails upon Jamie to experience VR for herself, she is, unlike Paul, allowed privacy in the room—despite the latter’s futile attempts to peer inside her HMD before reluctantly leaving, with final suggestions that she try the hang-gliding simulation—or the convent. Although Jamie finds herself at the same bus stop, where, at his request, she fishes a bus token from the tight jeans pocket of a long-maned Andre

[313] In *Osmose* and *Ephémère*, the attendant can see the immersant’s journey on a small screen, and in installation views, the audience is also able to see from the immersant’s point of view. However, emphasis is on the solitariness of the experience, and interaction with the attendant is kept to a minimum.

Agassi, when the scene pixelates and again resolves, it is Paul who joins her on the bus stop bench. Whereas Paul's wish-fulfillment fantasy involved Christie Brinkley telling him he was doing everything perfectly and asking him about his work as he rubbed her back (fig. 4), Jamie's involves a contrite Paul, emphatically stating how very wrong he was—to have invested their money without telling her, and for his virtual peccadilloes. For the remainder of her allotted 10 minutes, as he massages her shoulders alternately at the beach or on a rug in front of the fire, Jamie basks in the virtual Paul repeating, "I was wrong. I was so wrong." As the scene ends, Jamie delivers the punch line, calling, "Honey, give 'em a check!"

A final scene as the credits roll reemphasizes the fantasy of such virtual reality, highlighting the boundary between fact and fiction through a metacommentary on television itself. As Paul enters their apartment, Christie Brinkley, wearing Jamie's pajamas, greets him with domestic details and a welcoming kiss. Stepping out of the kitchen, Jamie chides, "Christie? That's my part; we talked about this."

"Helen!" Paul protests, using actress Hunt's first name. "Let her play."

As the audience, we are let in on the open secret that Paul and Jamie are imaginary characters, as invented as a VR system that not only offers interaction based on spoken word and physical touch, but with one's own real-world companions. The presence of actress/model Christie Brinkley, heretofore seen only within the virtual world and ready to fulfill any fantasy, doesn't dissolve the boundary between fact and fiction, it reinforces it. Paul and Jamie's apartment, where she stands, becomes a stage set where actors Hunt and Reiser play their parts in the "virtual reality" of the TV world. The episode raises anxieties about what counts as "real" in a highly believable (if not entirely immersive) virtuality, but the final scene allays those fears: it is easy to discern fact from fiction, just as the audience recognizes the constructed nature of television itself.

Mad About You captures a sense of the public's fascination with VR, but presents a highly imaginative system far removed from the technological reality—then, or now. In March of 1994, just one month after this episode aired, the Pacific Science Center in Seattle opened a new permanent exhibit called the Tech Zone, which featured brand-new VR activities. Reporter Larry Brown described this "high-tech, far-out world" in a feature article run the day the exhibit opened:

> - You're invited to play Virtual Hoops. You stand against a blue wall, put on a special glove, wait to see yourself projected onto a basketball court on a screen, then move your arm, and the on-screen ball moves with it. You bounce and shoot a video ball to play one-on-one against your video opponent. […]
> - You put on a virtual-reality helmet and find your way around a three-dimensional city. Hang-glide off the top of one of the buildings and feel the sensation of flying. Your body feels the action because your entire range of vision is enveloped.[314]

Reading this article on the heels of the *Mad About You* episode, I could hardly wait to experience this new technology, and eagerly persuaded my parents to take my siblings and me to the museum to check it out. Needless to say, the Pacific Science Center's Virtual Reality was, rather disappointingly, far heavier on the *reality* than was the virtuality imagined by the sitcom.

A long line of kids waited to check out Virtual Hoops, manned by a museum staff member who positioned participants in front of the blue backdrop, fitted them with the glove, and pointed them toward the screen where they would see an image of themselves inserted into a computer-generated environment (fig. 5). The technology of combining two images by filming one against a solid background, or chroma keying, has been used

[314] Brown, Larry. "Entering the Tech Zone." *Seattle Times* 5 March 1994: C1. Microfilm.

in Hollywood since its very early days and is a common technique in contemporary films and television. To this older technology, however, Virtual Hoops added the element of interaction through the glove, whose sensors are recognized by the computer. Wearing this glove, participants could "pick up" a virtual basketball resting in a rack that appeared beside them in the composited video, and then shoot it, over a simulated opponent, into the hoop. While seeing oneself present and moving in an environment that existed only in computer imagery was novel and fascinating, however, interacting with that environment proved more difficult. Picking up the ball involved holding one's gloved hand above the rack and hoping a ball would rise to meet it. The ball, once "attached," would cling tenaciously to that hand, in spite of attempts to dribble and shoot, and the shots themselves—which had to be aimed based on one's view of oneself and the hoop on the screen, as well as in full view of the camera—were difficult to sink. This is the type of "open" VR, combining real and virtual elements, that continues to be popular, largely for the creation of videos.

The hang-gliding simulator next to Virtual Hoops had a more traditional VR interface, but even lower-tech imagery. Wearing an HMD, the participant navigated the virtual environment by moving his or her head and using a joystick-like handheld controller. A short railing kept the participant from wandering away in the real world. Once inside the virtual world, comprised of brightly-colored vector shapes imitating a cityscape, the participant found him- or herself atop a tall building, strapped into a hang-glider. From there, one could theoretically glide out over the tops of the buildings, experiencing the full-body thrill Brown described—but I seemed to spend most of my time earthbound and turned around, trying simply to decipher and navigate the hard-edged and rather elusive graphical terrain surrounding me. Not only was this "enclosed" system, it was cumbersome and disorienting.

1994, as it happened, was more or less the apex of VR development and imaginings. With the fast rise of computer power in the 1980s, the possibility of immersive digital environments entered the public imagination as well as the goal lists of developers. In Disney's 1982 *Tron*, the protagonist, video game whiz Kevin Flynn (played by Jeff Bridges), is attacked by an AI that uses a laser to upload him directly into the computer mainframe. This cyberspace is dark and spacious, delineated by glowing grids and inhabited by anthropomorphic programs with whom Flynn must battle to survive and defeat the AI (fig. 6). Although *Tron* was clearly a fantastical imagining, highlighted by the heavy usage of computer graphics (which cost the film an Academy Award nomination for best special effects[315]), it highlights both increasing computer graphics technology and the fantasy of imagining humans inside the digital realm. By 1995, when Davies created *Osmose*, this technology had been implemented in multiple ways, been found wanting, and was already largely in decline.

A Brief History of Virtual Reality

In his *Virtual Art*, art historian Oliver Grau points out that there is a long history of artists attempting to create illusionistic immersive environments, from the first century BCE frescos at the Villa dei Misteri in Pompeii to the painted panoramas that became

[315] "The Academy thought we cheated by using computers," recalls director Steven Lisberger, interviewed on the occasion of the film's twentieth anniversary. "We used computer-generated imagery as an actual environment, which hadn't been done at that point. We did all those effects in about seven months, which included inventing the techniques." "Tron's 20th Anniversary/Director discusses groundbreaking computer animated film," *SF Gate* (January 9, 2002). http://www.sfgate.com/news/article/Tron-s-20th-Anniversary-Director-discusses-3236009.php

popular in Europe in the early nineteenth century.[316] Although these works aimed for and to some degree did achieve a sort of immersion, however, VR has its most direct artistic and historic roots in the development of stereography. In 1838, writes film and 3D historian Ray Zone, Sir Charles Wheaton presented his stereoscope and accompanying academic paper to the Royal Society of Great Britain, positing that since the brain perceives a separate image from each retina as a single object in space, presenting the eyes with pictures from slightly different planes would mimic that effect.[317] Combined with the rapidly-developing photographic technology, stereographs were soon impressing viewers with their uniquely immersive effect (fig. 7). The inimitable Oliver Wendell Holmes writes, in an essay describing processes of photography as well as the optical basis for stereography, that "The effect of looking at a good photograph through a stereoscope is a surprise such as no painting ever produced. The mind feels its way into the very depths of the picture."[318] Indeed, these "low-tech," proto-headsets displayed analogue imagery, even if fixed rather than animated, far superior to any of the '80s VR

This tactile metaphor of the mind "feeling its way" into the depths follows Holmes' earlier description of binocular vision, wherein he writes that "We clasp an object with our eyes, as with our arms" (though he feels compelled to clarify that this is "an illustration of the fact, rather than an explanation of its mechanism").[319] The sense of immersion that stereography creates, then, is that of a deep, haptic space—like the full, palpable space Davies strives for with *Osmose*. With his observation that "I leave my

[316] See Grau, Oliver. *Virtual Art: From Illusion to Immersion*, trans. Gloria Custance. (Cambridge: The MIT Press, 2003).
[317] Ray Zone, *Stereoscopic Cinema and the Origins of 3-D Film, 1838-1952.* (Lexington: University of Kentucky Press, 2007), 744.
[318] Oliver Wendell Holmes, "The Stereoscope and the Stereograph," *Atlantic Monthly* 3 (June 1859), 782-3.
[319] Ibid, 742-3.

outward frame in the arm-chair at my table, while in spirit I am looking down upon Jerusalem from the Mount of Olives,"[320] Holmes also prefigures the rhetoric of disembodiment that remains prevalent in discussions of VR.

At the same time that stereography was gaining popularity, so were moving images, in the form of a variety of small toys or machines that relied on the optical phenomenon of persistence of vision to simulate movement. The best-known of these is probably William Horner's 1834 Zoetrope (fig. 8), in which a series of successive images on a strip of paper, when viewed through slits in a spinning drum, appeared to be in motion: the forerunner of animation. The Zoetrope improved upon the earlier Phenakistoscope by Joseph Plateau (1831), eliminating the mirrors necessary for viewing the latter and making it viewable by more than one person at once. It wasn't long before photography—as well as stereography—combined with motion picture devices to create early cinematography. The first patent for this type of a device was issued, according to Zone, to Parisian optician Jules Duboscq, whose "stereoscope-fantascope or Bioscope" of 1852 claimed to combine "the essential properties of the stereoscope with the most wonderful properties of M. Plateau's Phenakistoscope," animating a series of stereographs on a spinning disk. Though the device was not commercially viable, requiring the production of so many stereographs, it may be seen as the first attempt at 3D cinema.[321]

The immersive power of cinema, even in its earliest, two-dimensional, days, was soon evident; the well-known story of audiences at the Lumiere brothers' screening of *L'Arrivee du Train* reacting with terror to the locomotive that appeared to invade their

[320] Ibid, 746.
[321] Jules Duboscq, "Sur le Stereoscope," *Bulletin de la Societe Francaise de Photographie* 3 (March 1857): 77-78, quoted in Zone, 26.

space testifies to the power of the cinematography to engage and immerse. It also speaks to the ability of such technology to do without having to seal the viewer away from clues of the "real." Artists and inventors continued to push the medium further: Fred Waller invented the Cinerama, a cinematographic system that captured, and subsequently projected, material from multiple cameras to produce a motion picture greater than viewers' visual field for a uniquely surrounding and engrossing experience. Morton Heilig, a young filmmaker and visionary, experienced Cinerama and immediately understood it, as he told Howard Rheingold—then-editor of the *Whole Earth Review* and author of the seminal Virtual Reality (1991)—as "a revolution[,] because it was a real enlargement of the film experience—something that was badly needed when television started to catch on."[322] With the television set becoming increasingly ubiquitous in the early 1950s and Hollywood feeling threatened,[323] Heilig envisioned, and believed he could sell, an immersive experience that expanded on Waller's efforts, stimulating not just the senses of sight and hearing, but touch and smell as well. The result was his *Sensorama* (fig. 9), a pre-digital VR system that went far beyond today's solely audio-visual systems, but failed to achieve the funding to make it commercially viable. As Heilig bemoaned to Rheingold in the early 1990s, "If I had written a proposal for a theater that would kill people, I guess I might have done better with finding funding."[324] Waller's Cinerama did arise from his earlier work providing large-screen views for Air Force flight simulators, and although Heilig obtained a patent for a head-mounted display in 1960, "the Telesphere mask," [325] it is computer scientist Ivan E. Sutherland's HMD,

322 (New York: Touchstone, 1991), 54.
323 Ibid.
324 Ibid, 60.
325 Ibid, 54, 58.

developed in the late ’60s with Department of Defense (DoD) support, that usually gets credit as the first of its kind. Again, we see the continuation of the trend so firmly established in the history of the first chapter of this work: the military gets the money.

Indeed, Grau traces the birth of “interactively experienced virtual reality” to Sutherland, whose revolutionary Sketchpad, developed in 1963 at the Massachusetts Institute of Technology (MIT), allowed direct graphical interface between user and computer. A few years later, Sutherland developed an even more direct user interface with the HMD (fig. 10), which, equipped with head-tracking sensors, enabled a user to navigate a virtual, polygon-comprised world. Sutherland described this hardware as “Special spectacles containing two miniature cathode ray tubes… attached to the user's head.”[326] He affectionately dubbed the system, first researched and developed at Harvard with funding provided by the DoD’s Advanced Research Projects Agency (ARPA), and then produced at the University of Utah in 1970, “The Sword of Damocles,” due to the somewhat frightening bulk of hardware suspended above the user’s head[327] (fig. 11).

Developments like these led programmers to begin experimenting with human/computer interfaces to transport the former—if not physically, as in *Tron*, at least mentally—into the latter. The theories of early computer pioneers such as Norbert Wiener had already conceived of the mind and body as fundamentally machinelike, operating on a system of feedback that would allow for transmission of information (or data) between humans and technology.[328] But it was only in the 1970s and ’80s that the

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[326] Sutherland, Ivan E. “A Head-Mounted Three-Dimensional Display,” in *Proceedings of IFIP*, 1968. Archived online by Ars Electronica at http://90.146.8.18/en/archiv_files/19902/E1990b_123.pdf.
[327] Randall Packer and Ken Jordan, Introduction to Sutherland, “The Ultimate Display,” in *Multimedia: From Wagner to Virtual Reality.* (New York: W.W. Norton & Company, 2001), 233.
[328] See Wiener, “Men, Machines, and the World About,” *The New Media Reader*, Noah Wardrip-Fruin and Nick Montfort, Eds. (Cambridge: The MIT Press, 2003).

computer became a tool for the kind of immersive *imagery* sought by earlier analog techniques, creating illusionistic spaces that could be navigated in a way that began to literalize Wiener's cybernetic feedback loop.

Between his invention of Sketchpad and the "Sword of Damocles" HMD, Sutherland published a paper in the 1965 Proceedings of the IFIP[329] Congress, entitled "The Ultimate Display." This paper is far different from the one he would publish in the same journal in 1968, discussing the HMD and listing, at length, the mathematical and programming processes and challenges of drawing the virtual world to which it offers entry. Rather, "The Ultimate Display" is a very brief, but pithy, meditation on the possibilities for interfaces between human and computer. Before either monitors or keyboards were widespread (Sutherland points out that "tomorrow's computer user will interact with a computer through a typewriter"), he imagines the digital display as "a looking glass into a mathematical wonderland."[330] He imagines human-computer interfaces utilizing not just a "light pen" or stylus, or "knobs and joysticks of various kinds," but voice and gesture recognition and even gaze tracking. He concludes with the grandest vision yet: "The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. Handcuffs displayed in such a room would be confining, and a bullet displayed in such a room would be fatal. With appropriate programming such a display could literally be the Wonderland into which Alice walked."[331]

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[329] International Federation for Information Processing Congress
[330] Sutherland, "The Ultimate Display," reprinted in in *Multimedia: From Wagner to Virtual Reality,* Edited by Randall Packer and Ken Jordan. (New York: W.W. Norton & Company, 2001), 233.
[331] Ibid, 236.

Sutherland's description of the eponymous ultimate display bears similarity to the eerie nursery, or playroom, imagined by science fiction author Ray Bradbury in his 1950 short story "The Veldt." The centerpiece of the fictional Hadley family's Happylife Home, the extravagant nursery is a virtual reality marvel, its walls dissolving into crystal displays complemented by surrounding sounds, smells, and even simulated atmospheric conditions—all reflecting the users' "telepathic emanations… [in order] to fill their every desire."[332] In Bradbury's story, the Hadley parents, alarmed that the children's playroom seems to be "stuck" on Africa—visit it, only to find themselves charged by alarmingly realistic lions that leave George and Lydia laughing and crying, respectively, outside the slammed door. Noticing his wife's reaction, George comforts her, "Walls, Lydia, remember; crystal walls, that's all they are. Oh, they look real, I must admit - Africa in your parlor - but it's all dimensional, superreactionary, supersensitive color film and mental tape film behind glass screens. It's all odorophonics and sonics, Lydia."[333] Nonetheless, the Hadleys decide that the Africa simulation, with its echoing screams and unnerving lions dining on fresh kills, is too sinister and must be shut down. The children, however, react hysterically to George's decision, pleading for just one more minute in the simulation—their own Wonderland. The parents acquiesce, only to be lured, in the story's chilling conclusion, back into the playroom, where the children lock them in. It was bullets Sutherland imagined as being fatal in his "ultimate display"; 15 years earlier, in Bradbury's story, it is the lions.

In 1991, collaborators at the University of Illinois at Chicago's Electronic Visualization Laboratory produced a virtual reality system that falls somewhere between

332 ((Page #))
333 ((Page #))

Sutherland's Damoclean HMD and Bradbury's sci-fi nursery. Artist Daniel Sandin, engineer Thomas DeFanti, and then-graduate student Carolina Cruz-Neira created the CAVE (Cave Automatic Virtual Environment) (fig. 12), a VR installation that combines computer-generated imagery with the physical space itself, and which they describe in their essay "A 'Room' with a 'View,'" published in 1993. The room, or cave, is a partial cube with sides three meters square. High-powered rear projectors beam stereo images onto the screens that comprise the cave architecture—three side surfaces and a floor. The user wears stereoscopic glasses, their liquid crystal displays synchronized with the projector controller, that transform these doubled projections into seemingly three-dimensional objects—in the real space of the physical world, which the user can still see.[334] The developers call the Cave a "less intrusive interface" because it doesn't necessitate an HMD, which "can be uncomfortable and disorienting, because the viewer is cut off from the real visual world." Because the viewer can move about the space physically untethered from cables and without having to worry about tripping over them, the authors write, "the Cave frees the viewer to collaborate more fully."[335] In the Cave, reality is augmented rather than replaced, allowing for a shared space and experience.

Placeholder

In 1992, writer, scholar, and software designer Brenda Laurel and media artist, architect, and filmmaker Rachel Strickland co-directed the VR project *Placeholder* (fig. 13), which uses HMD technology rather than the Cave environment, but also utilizes

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[334] These glasses, CrystalEyes, were originally produced by StereoGraphics Corporation, a company that has since been acquired by RealD Inc. RealD is now dominates the market in 3D eyewear and cinema display technologies as 3D films have become increasingly ubiquitous, with such blockbuster releases as James Cameron's *Avatar* (2009), DreamWorks' *How to Train Your Dragon* (2010), and Pixar's *Toy Story 3* (2010).

[335] IEEE Spectrum, October 1993, pp. 30-33.

physical space to contain, and enrich, the immersants' experience. *Placeholder* was one of nine VR projects produced as part of the Art and Virtual Environments Project within the Computer Applications and Research Program of the Banff Centre for the Arts, and made use of the Centre's extensive resources, including senior research analyst John Harrison and sound designer Dorota Blaszczak.[336]

Two immersants at a time enter *Placeholder*: physically, each stepping into a "magic circle"—a ring defined by low stone walls (and corresponding to the 10-foot diameter of the HMDs' tracking devices) (fig. 14)—and virtually, into an interactive space comprising three distinct natural realms, based on, and using images and sound from, actual locations in Banff National Park. Immersants initially find themselves in the Cave, but can move through special portals to and from the Waterfall and River Valley, each of them designed to evoke a specific "sense of place."[337] This sense of place is further modified by the ability to "embody" one of four archetypal "critters" represented by icons on the walls of the cave, each of whom attempts to lure the immersant through descriptions of its unique characteristics: when the immersant's own head intersects with a particular icon, he or she becomes embodied as that creature: Crow, Spider, Snake, or Fish. These bodies function as what Laurel calls "smart costumes," shaping not just how the immersant moves through the space (for example, a Crow immersant would flap to fly), but "how a person looked, sounded, moved, and perceived the world."[338] As

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[336] Mary Anne Moser, ed., with Douglas MacLeod for the Banff Centre for the Arts. *Immersed in Technology: Art and Virtual Environments*. (Cambridge: The MIT Press, 1996), 319.
[337] Brenda Laurel, Rachel Strickland, Rob Tow, Interval Research Corp. "Placeholder: Landscape and Narrative in Virtual Environments." *Computer Graphics* (28, no. 2, 1994), 119.
[338] Ibid, 122. The designers describe plans they had to modify the critter's vision to reflect its particular characteristics, e.g. a sharp focus and attraction to shiny objects for the Crow, clarity in water and blurriness outside of it for the Fish, etc., but had to abandon them due to time constraints.

immersants move through the space, they can grasp[339] and move objects as well as interact with one another. An immersant can also, through the "voiceholders" present throughout the environment, leave his or her own trace in the form of a vocal recording, or listen to the recordings of others who have traversed the space before. A Goddess, often voiced by Laurel, helps guide the immersants, who hear her as if in their own heads. Although *Placeholder* was on view for a relatively short time in the summer of 1993, the team produced a video by the same name that introduces the project and provides footage of the original locations, the actors' improvisation, individuals being immersed, and their point of view (POV) [340] journeys.[341]

In 1994, Laurel, Strickland, and collaborator Rob Tow published an article in SIGGRAPH's *Computer Graphics Quarterly*,[342] in which they are candid about the creation of *Placeholder*, which they call "a research project which explored a new paradigm for narrative action in virtual environments,"[343] rather than a necessarily complete and self-contained work of art. The authors' descriptions of their vision for *Placeholder* are lofty, from the "magic circle"—which doesn't simply contain the

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[339] In order to facilitate interaction with the virtual environment, the team designed a tool they called the "grippee"—a flexible piece of plastic held in each hand and squeezed in order to grasp and release an object. When the immersant can see his or her hands, they are represented not as the traditional floating vector graphic object, but as points of light. The grippee was designed and engineered by Steve Saunders (Moser et al, 323).

[340] Hayles describes the POV as follows: "The body marks one kind of presence; the point of view, or pov, that constructs the user's position within the simulation marks another. As marker of subjectivity, pov is more than an acronym, more even than a noun. In the parlance of VR, it functions like a pronoun, a semiotic container for subjectivity." Although Hayles doesn't capitalize POV, I have done so throughout this manuscript in the interest of clarity. N. Katherine Hayles, "Embodied Virtuality: Or How to Put Bodies Back into the Picture," in *Immersed in Technology: Art and virtual Environments*. Edited by Mary Anne Moser with Douglas MacLeod for the Banff Centre for the Arts. (Cambridge, Mass: The MIT Press, 1996), 14.

[341] *Placeholder: Landscape and Narrative in a Virtual Environment* (1993 project documentation), 15:08. Posted to Vimeo by Rachel Strickland, August 5, 2011, http://vimeo.com/27344103.

[342] SIGGRAPH is the Association for Computing Machinery (ACM)'s Special Interest Group on Graphics and Interactive Techniques. Its mission, according to the ACM Web site, "is to promote the generation and dissemination of information on computer graphics and interactive techniques." (www.acm.org)

[343] Laurel et al, 118.

immersant, but, in Strickland's words, evokes "the primordial stage—that zone differentiated from darkness by the illumination of the campfire"[344]—to the possibilities of a different embodiment, through, as Tow puts it, shedding the "primate body" for a non-mammalian one and in turn gaining a sense of "what it is to be an embodied human."[345] Nonetheless, the authors are forthright about the difficulties *Placeholder* faced, including their financial, technical, and time constraints. The team's goal, for example, to create entirely different embodied visual experiences for each of the four critters—Crow's intensified awareness of reflective objects, Fish's clear vision underwater and blurred vision in air, etc.—had to be abandoned due to lack of resources. As Tow concludes in the last sentence of the article, "This effort was incomplete, and highly tentative; many questions remain."[346] The "effort," however, which involved a wide variety of collaborators, credited by name—from media artist and photographer Michael Naimark to professional storyteller Lucinda deLorimier—not only explored VR as "the art of creating spaces with qualities that call forth active imagination," as Laurel writes, but implemented the "motto [of] 'no interface,' expressing [the] desire to maximize naturalness, to enable to the body to act directly in the world and to minimize distraction and cognitive load."[347] Similar ideas can clearly be seen reflected in Davies' projects of the next two years.

In 1991, Laurel published *Computers as Theatre*, which concludes with what she later calls "a rhapsodic coda about virtual reality,"[348] and which presciently outlines many of

[344] Ibid, 120.
[345] Ibid, 125.
[346] Ibid, 126.
[347] Ibid, 121.
[348] Laurel, Brenda, *Computers as Theatre*. Reprinted in softcover with an additional chapter. (Reading, Mass.: Addison-Wesley, 1993), 199. Page references are to the 1993 edition.

the primary aspects of what would become *Placeholder*, from magic circles to the petroglyphs that would become *Placeholder*'s critters and voiceholders. By the time of the book's reprint in softcover format, however, Laurel had added a seventh chapter/afterword, "Post-Virtual Reality: After the Hype is Over." Beginning with the observation, "A lot has happened in the last three years,"[349] Laurel reflects on the changes that had occurred in the technology and rhetoric of VR just since she had finished her book in 1990. Even as popular culture was embracing what she called the "fad phenomenon" of VR—a trajectory she likens to video games and the ill-fated Atari, where she worked before its crash—those involved with VR "began scrambling… to get some distance from the all too vivid spectacle of the hype-fueled, VR road-and-media show that rocketed VR pundits to the pinnacle of pop culture and then sent us burning back into the atmosphere, noticing too late that we were in the decaying orbit of a fad."[350] Already, in 1993, Laurel identified the imminent decline of VR, as it failed to live up to the hype of its being the next big thing in entertainment—and, subsequently, moneymaking. Laurel's position within the industry allowed her unique insight into the demise of technology that was still peaking in the popular imagination—as well as into the lessons VR, with its synesthetic capabilities, offered. "[VR] was hailed as the techno-wave of the future," Laurel writes, "with potential to transform everything from movies to medical imaging. It was also demonized as the latest in mind-control drugs and the world's baddest war machine."[351] Of more interest to Laurel than these hyperbolic claims, however, is what the medium of VR can tell us about the wider culture: "Media represent us to ourselves in a multidimensional way; beyond the content of any particular representation, the characteristics of the medium itself give us insight into the

[349] Ibid.
[350] (Reading, Massachusetts: Addison-Wesley Publishing Group, 1993), 200.
[351] Ibid, 210.

invisible cultural context."[352] It is this invisible cultural context I wish to probe in Char Davies' VR projects *Osmose* and *Ephémère.*

Osmose* and *Ephémère

Unlike *Placeholder*, which was on view for a limited time exclusively at the Banff Centre for the Performing Arts as part of its Art and Virtual Environments Project, Char Davies' *Osmose* and *Ephémère* have been exhibited around the world: Davies' Web site, www.immersence.com, states, in an article reportedly updated in early 2008, that to date 35,000 people had been immersed in the two projects. As much as her artistic vision, it was Davies' unique access to significant corporate resources—monetary as well as technical—that allowed *Osmose* to come together at an unprecedented speed, subsequently to travel internationally, and to engage such widespread interest. [353] As Oliver Grau writes, *Osmose* "has received more attention in the international discussion of media art than perhaps any other contemporary work," and, though relatively few have personally experienced it, "many times that number of art aficionados have avidly followed the debate on aesthetics, phenomenology, and reception of virtual art that has homed in on this particular work."[354] Although only one viewer can be immersed at a time, many more are able to participate vicariously in the experience via the small "theaters" that generally accompany the pieces' museum installations (fig. 15). Viewers wear polarized glasses and headphone to simulate the view of the immersant, who is visible in silhouette in the adjacent immersion chamber.[355] Lack of personal immersion—

[352] Ibid.
[353] *Osmose* was first exhibited in a solo show at the Musée d'art contemporain de Montréal in 1995, and since then *Osmose* and *Ephémère* have been shown in the United States, the United Kingdom, Mexico, Australia, and Spain.
[354] Grau, 193.
[355] *Osmose* video. This, too, is an expansion on themes introduced in *Placeholder*, where a "handful of onlookers" was able to watch the immersants and participate in their experiences via monitors and

or even installation viewing—hasn't stopped many authors from describing the projects in glowing terms.

Indeed, Laurel's own self-described "rhapsodic" rhetoric on VR has nothing on the extensive verbiage praising Davies' projects. Grau's own description of *Osmose* is paradigmatic of the tone of much of this writing. He begins, "Like a diver, solitary and weightless, the interactor first glides out of a grid of Cartesian coordinates into the virtual scenarios: a boundless oceanic abyss, shimmering swathes of opaque clouds, passing softly glowing dewdrops and translucent swarms of computer-generated insects, into the dense undergrowth of a dark forest."[356] By far the majority of the reviews of Davies' pieces are similarly effusive, with language frequently bordering on the elegiac. A statement alternately ascribed to one of the construction workers who installed the piece in Montreal, a head curator at one of the museums, or an anonymous signer of the guestbook is that after experiencing *Osmose*, the individual was "no longer afraid of death."[357] Other immersants have emerged, Davies reports, weeping, nostalgic, euphoric, or reporting having experienced the body in an entirely unique way.[358] Davies herself repeatedly uses the phrase "altered states" to describe immersants' experiences,

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headphones. Laurel et al, 118. Laurie McRobert points out that "the stereoscopic glasses were only used in the first two public exhibitions of *Osmose* in Montreal and New York City in 1995. Subsequently, because of lack of corporate support—Silicon Graphics would no longer loan Davies the necessary hardware—she had no option but to offer a single-view projection for the audience based on what the immersant was seeing but only through one eye." *Char Davies' Immersive Virtual Art and the Essence of Spatiality*. (Toronto: University of Toronto Press, 2007), 166 n.40.

[356] Grau, p. 193

[357] See Brenda Laurel, "When Computers Become Human" in *Talking back to the Machine: Computers and Human Aspiration*. Peter J. Denning, ed. (New York: Copernicus/Springer-Verlag, 1999), 106-107; "Reverie, Osmose and Ephémère: Dr. Carol Gigliotti Interviews Char Davies" in *n.paradoxa* (vol. 9, 2002), 66; Mark Pesce, "3-D Epiphany," *Salon Magazine* (June 13, 1998), http://www.salon.com/1998/06/13/feature947640934/singleton/

[358] See, especially, Gigliotti; and Char Davies, "Changing Space: Virtual Reality as an Arena of Embodied Being" in *The Virtual Dimension: Architecture, Representation, and Crash Culture*. John Beckman, ed. (New York: Princeton Architectural Press, 1998), 144-155.

comparing the effects to the results of deep meditation (though her study does not extend, she points out, to drug usage).[359]

Although relatively few individuals are able to be personally immersed in *Osmose* and *Ephémère*, the artist has produced videos that are available at her website, immersence.com, and on DVD. These videos address some technical specifications of the pieces, but primarily emphasize the experience and aesthetics of the computer-generated space, highlighting the artist's vision of the projects as space-creating and facilitating the viewer's self-exploration and -discovery. The *Ephémère* video is 16 minutes long and far simpler than its predecessor, the 33-minute *Osmose* video to which I'll turn in a moment, which includes a brief documentary and participant interviews in addition to a flythrough of the virtual world. The *Ephémère* video begins with five textual slides that briefly introduce the navigational interface and the project's concept. After explaining that *Ephémère* is divided vertically into three realms (landscape, earth, and body) and is seasonally chronological (with the immersion beginning in winter), and that objects in the environment react to the immersant's presence and gaze, the text fades and the flythrough begins. Fuzzy particles float against a dark background, gradually lightening to reveal spiny forms that slowly articulate to form the branches of a tree. A hollow wind seems to blow through the monochromatic environment as the mist fades to reveal a clearing in a forest of transparent, stylized trees. This landscape, as it turns out, is one of the more readily identifiable in the project, as the immersant's POV travels through an increasingly abstract realm of glowing polygons. These suggest, at times, sunlit streams or a glowing

359 See Davies, "Changing Space" (1998); with John Harrison, "*Osmose*: Towards Broadening the Aesthetics of Virtual Reality" (1996); "Landscape, Earth, Body, Being, Space, and Time in the Immersive Virtual Environments *Osmose* and *Ephémère*," in *Women, Art, and Technology,* Judy Malloy, ed. (Cambridge: MIT Press, 2003); and others.

chartreuse seed exploding into the transparent shards of an origami flower, or simply devolve into intersecting planes of indistinguishable texture (fig. 16). All of this is set against an insistent, yet morphing, aural tapestry of strings and other sounds, closely linked to the visual components of the virtual space.[360] The earlier *Osmose* video, alternatively, provides not just more literal imagery, but sets up the flythrough with a mini documentary (as the disc calls it) and post-immersion participant feedback.

The Osmose video opens onto the scene of a lone man, silhouetted against a gradient golden background evocative of a sunset, donning the equipment to enter *Osmose* (fig. 17). Against this imagery, the narrator solemnly introduces the project in the soaring language echoed in so many of the flowing reviews: "As a space for exploring the interaction between self and world, *Osmose* allows one to let go of habitual perceptions and explore the subjective experience of consciousness as being in the world." The poetic, philosophical nature of this virtual space is then further highlighted with a quote from philosopher Gaston Bachelard, whose *The Poetics of Space* Davies frequently cites in her writing, and whose words appear, along with others, in the "text" realm of *Osmose*: "…by changing space, by leaving the space of one's usual sensibilities, one enters into communication with a space that is psychically innovating… For we do not change place, we change our Nature." Still against the backdrop of the single immersant adjusting the vest that will measure the expansion of his chest and allow him to navigate the space via his breath, the narrator continues that, unlike other virtual environments that aim to create

[360] Rick Bidlack describes the process of developing a sound world for *Ephémère* in a technical statement appended to Davies' unpublished dissertation. Davies herself has mistakenly stated that all the sounds in *Ephémère* derived from a viola, digitally altered (see Davies, "Virtual Space," http://www.immersence.com/publications/char/2004-CD-Space.html); in fact, as Bidlack explains, the sounds came from four sources: his viola, animal noises, natural sounds such as running water and breaking sticks, and digitally synthesized pure tones and white noise. ("The Sound World of *Ephémère*, 1998, Appendix to Davies, "Landscapes of Ephemeral Embrace," 11)

shared space, *Osmose* is about solitude. Quoting Bachelard again, he continues, "It is only when human solitude deepens that the intimate space of self and world-space blend."

The spaces blend visually on the screen as the immersant dons the HMD and our view of him fades, replaced by a grid of white lines extending into space against a dark background. This is the "first world encountered," as the narrator puts it, a space that orients the viewer while nodding to the typical Cartesian conception of computer space and virtual reality (and paralleling the earlier-discussed aesthetics of *Tron* and *Snow Crash*). The grid quickly gives way to the nebulous imagery and indistinct aural tapestry of *Osmose*, while the narrator describes how "it is possible to travel anywhere within these worlds by simply breathing: in to rise, out to fall, while leaning gently to change direction." After a few moments' drift through translucent, ambiguous imagery, during which the narration points out how *Omsose*'s soundscape is woven entirely from sampled male and female voices, and is localized and responsive to facilitate a sense of space, the scene again returns to the physical world and the equipment that enables the experience of the virtual one.

"To experience immersion in *Osmose*," the narrator tells us, "one has to dress, like a diver entering the sea." He goes on to describe the vest the immersant wears, with sensors to measure breath (the expansion of the chest) and location in space, as well as the HMD designed to provide 360º visual imagery and wraparound sound (fig.18) . An odd animation follows, created using the chroma key technique discussed earlier, and distinctly similar to *Mad About You*'s imaginative representation of VR. Here the technology-bedecked immersant appears against the computer-generated virtual space as he would see it through his HMD. As he turns, leans, and breathes, in the gridded orientation space for maximum clarity, the image in front of him reflects his changing view (fig. 19). The scene shifts briefly to video of Davies, in SCUBA gear, “practicing buoyancy control” underwater, before returning to the image of the immersant apparently within the virtual space, walking around the tree in the clearing despite the narrator’s specific description of the immersant as floating. The video continues with brief technical details about the programming and hardware required, the set-up of the installation view, and a diagram indicating the spatial structure of *Osmose* (fig. 20), followed by brief snippets of each of the twelve realms identified.

“Based on participant response, immersion in *Osmose* has a profound effect,” the narrator intones as the exit sequence is replaced by slow-motion video, dramatically lit, of the attendant removing the immersant’s HMD as the latter blinks in wonder. The immersant, identified as interactive media artist Henry See, provides the first of two testimonials, struggling for words and closing his eyes in recall—or rapture—as he tries to explain the piece’s effect. He is followed by another interactive media artist, Jon McCormack, giving his reactions as he is helped out of the sensor vest. “It was sort of like dying and going to heaven or something,” he smiles, “…it’s like a mythological kind of nature.” The video returns to the image of the silhouetted individual preparing for immersion, overlaid first by a brief text summarizing the piece, and then the earlier Bachelard quotation about changing Nature through changing place. An interlude of bubbles rising through blue water and a solitary diver backgrounds the statement, “The following images and sounds were recorded in real-time during a fly-through performance of the work," and the video returns to the silhouetted immersant, shortly transitioning exclusively to the view from the HMD.

Prepared as one has been by the preceding material—the glowing reviews, the poetic possibilities of transcending one's nature—one can easily be mesmerized by the subsequent images. The fly-through glides through all twelve realms, dwelling provocatively in the liminal spaces between them and highlighting the uniquely translucent imagery that gives the space its dreamlike, phantasmagoric quality. As the gridlines dissolve, the center point and anchor of the project, the Clearing, appears: dark and calm, yet far from empty, as night sounds—birds, insects, perhaps bats and even a wolf or two—fill air that already seems to have a fullness or thickness of its own (fig. 21). Luminous particles float on the dark currents of a stream winding through the space, while shimmering worms wriggle by more quickly. Instrumental sounds join the ambient chirping and chattering, their alien harmonies haunting and indefinable, but evocative of stringed instruments or even far-away train whistles. Although these sounds border on the ominous, it quickly becomes apparent that there is nothing to fear (and, indeed, little to interact with at all) in this digital space. Transparent forms drift past, resolving into the spiny branches of an abstracted tree. The stream, with its glowing cargo, is visible in the background, through its trunk. Below the trunk, the tree extends roots that mirror its branches into earth that seems to undulate in transparent waves, its contours ambiguous and sketchily defined.

As the tree recedes into the distance, dim shapes drift into view, obscuring it in a whitish haze as an insistent rustling replaces the instrumental sounds and joins the chattering, indicating entry into the Forest. Green leaves and the fronds of pale ferns overlap to fill the space, some sprouting organically from realistic branches, and others floating on geometric edges as thin and flat as blades. A swarm of iridescent worms drifts by, accompanied by a vaguely electronic burbling, as the leaves part to reveal darker and hazier depths. Back in the clearing, the Tree, a monochromatic sketch done in geometric shards, has its own percussive soundscape, as if an invisible woodpecker were working away somewhere in the distance. Drifting nearer the branches one first sees the shapes of Leaves, and then is drawn inside them, where glowing particles now dance frenetically against the fuzzy latticework of its abstracted cellulosic structure. After a brief return to the Clearing, we begin to sink below ground level, into the depths of the Pond, where the water seems to consist of transparent, tissue-like strata that begin to obscure the tree as it is glimpsed from below, but reveal again the roots, alive with the radiant particles it seems to imbibe (fig 21). Beneath the roots, vaguely spherical objects hover in the Subterranean realm (fig. 22),[361] at once evocative of boulders or cells, with seemingly woven, faceted surfaces: neither hollow nor solid, and posing no obstacle to the immersant's movement. Deeper still, in Earth, trails of mist evoke a planetary atmosphere, just resolving into a reticulated surface before fading, in turn, into the acid green characters of Code world (fig. 23). Accompanied by a distinctive electronic burping and whirring, the passages of code form glowing, rigid planes, not unlike the distinctive imagery the Wachowski brothers used to represent the Matrix. This too dissolves, replaced by organic chirping and rustling, as the immersant completes the full circle and descends into the Clearing. We again drop below the surface of the Pond, but this time sink deeper into the Abyss, where the darkness is barely broken by slow-moving

[361] This realm is so-labeled in the *Osmose* video, but not on the charts outlining the project's spatial structure.

luminous particles, which now seem to drift through the thickest of mists. Gradually, a form materializes from the darkness, a greenish-gray, stony surface which, as the immersant gazes down, seems to hang suspended over a deep and impenetrable void. Another object spins into view, a rather crinkled gray bubble, the Lifeworld, which houses, under spangled layers, the clearing and its spiny tree. Instead of dropping into the clearing, however, we hover in the turbid Cloud above it, gradually ascending through whitening mists into the Text realm, where black characters form planes similar to those of Code world, this time presenting poetry and prose in English and French against a meditative soundtrack suggestive of strings. As the session comes to a close, the whiteness of the Text realm begins to dissolve, revealing a transparently-wrapped package against the blackness of space. The parcel, gray and crinkly like the Lifeworld, seems to drift backward in space, releasing glowing particles like tiny bubbles from a sinking stone, until it shrinks completely and disappears from view. The particles swirl for a moment after its disappearance, before they, too, fade from sight.

This tour, skillfully guided by a professional and even under his volition rather than one's own, is quite possibly, if not strictly the *fullest*, the most enjoyable way to experience *Osmose* and arguably the closest to the artist's vision, as I discovered when I made my own pilgrimage to the artist's Montreal studio in 2010 to experience the projects in person. In *Neuromancer*, console cowboy Case experiences "the bodily exultation of cyberspace" as he straps on his dermatrodes and completes missions in the virtual realm. In *The Matrix*, ports on the backs of their heads allow Neo and others to jack back in to the Matrix they now know is a computer construct, but which looks and behaves like the Reality they once knew it to be. In *Snow Crash*, the interface between human and machine is so seamless that a computer virus contracted in VR produces a mental breakdown in the physical world. Even in *Mad About You*, events experienced in virtual space are “real” enough to foment real-world drama. *Osmose* and *Ephémère* are nothing like that.

First of all, the equipment necessary to experience these two virtual realms is determinedly cumbersome. In the studio loft that now houses the project, John Harrison helped me into a vest that slid over my head and tightened snugly around my ribcage, with a bellows tube connecting the two sides of the vest across the front of my chest. This sensor is designed to measure the chest expansion that indicates breathing, so the vest was necessarily quite tight. The vest, however, was nothing compared to the HMD, Division Ltd.’s DVisor. At nearly nine pounds, with most of that weight unevenly distributed toward the front, the HMD is distinctly burdensome and uncomfortable. Though it was tightened close to my head with a mechanism similar to a bike helmet, I still felt the need to support the projecting visor with my hands to balance the load on my head and neck. The HMD seals out most external sights and sounds (though small glimpses of the floor may still be caught where the helmet meet the bridge of the nose), rendering one rather vulnerable in addition to off-balance, and glad for the assistance of the immersion attendant.

Secondly, although the audio in the HMD is excellent, the visuals are significantly lacking. The DVisor has a display of just 294 by 141 pixels, though since the two screens sit so close to the eyes, the result is a field of vision that is 105° vertically and 41°

horizontally.[362] Davies preferred this helmet, Harrison said, manufactured from twin Sony Watchman TVs (which account for much of the helmet's weight), because its display did extend to the user's peripheral vision, contributing to a more immersive experience.[363] Because the LCD screen is in such close proximity to the viewer's eyes, some viewers also experience, as I did, a chromatic separation or "rainbow effect," wherein the horizontal registers of the image tended to produce a color ghosting effect in red, green, or blue. The HMDs, which are no longer manufactured (Davies' team bought the last five when the company liquidated its stock, according to Harrison), have also suffered from age and wear; although Harrison fitted me with "the best" one, the screens had visible dirt or scratches and a blurry spot in the upper right-hand quadrant of the left screen. Combined, these factors draw continual attention to the visual aspect of the experience, making a sense of full immersion much more difficult.

Finally, between the heavy HMD and the breathing, leaning, and deep-knee bending required to navigate the virtual spaces, immersion in *Osmose* and *Ephémère* is also an extraordinarily physical experience. I visited the studio, which was cooled by just an overhead fan, on a rather warm morning, and despite being in excellent physical

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[362] Jerrold D. Prothero, "The Role of Rest Frames in Vection, Presence and Motion Sickness." Unpublished doctoral dissertation (University of Washington, 1998), 45. Available online at http://www.hitl.washington.edu/publications/r-98-11/r-98-11.pdf.

[363] The Sony Watchman FDL-310 is a flat-screen color LCD television that has been popular for projects like this. Scientists at the University of California, Santa Barbara used the FDL-310 to make their own HMD for a psychological experiment on visual perception of scale. Their description of their own HMD helps explain why the resolution in the DVisor is so low: "[Our HMD] consists of two Sony color LCD active-matrix television screens (model FDL-310) and lenses that produce collimated images for each eye. These LCD screens have a rated resolution of 320 lines by 240 lines (horizontal x vertical), but after accounting for the color mask the effective resolution is actually closer to 210 lines by 160 lines. Interfacing with the optics in our HMD loses even more resolution, leaving a final, effective resolution of 110 lines by 100 lines. When worn, each display subtends about 40° by 35° (horizontal x vertical])." Andrew C. Beall, Jack M. Loomis, John W. Philbeck and Thmas G. Fikes, "Absolute Motion Parallax Weakly Determines Visual Scale in Real and Virtual Environments." SPIE Proceedings Vol. 2411 Human Vision, Visual Processing, and Digital Display VI (1995), 3. Available online at http://www.recveb.ucsb.edu/pdfs/BeallLoomisPhilbeckFikes-95.pdf.

condition, I quickly found myself sweating, with beads of perspiration rolling down my arms as they supported the HMD. The video flythrough makes traveling through the virtual environments look easy, but actually arriving at any given location while immersed requires significant effort. Indeed, most likely because Davies emphasizes that these environments are about *being*, rather than *doing*, the "controls" of the embodied interface feel imprecise and even unresponsive, thwarting, to some degree, the desire, as well as the ability, to travel to a particular location.[364]

Osmose and *Ephémère*'s difference from the VR setups imagined by *Neuromancer*, *The Matrix*, *Snow Crash*, and *Mad About You* are largely intentional. The rather cumbersome gear, which Davies has likened to diving gear, is necessary, she points out, for entering a new spatial realm: "There are many, many correlations between diving and VR. One of them, the most simple, is that when you're diving you have to put on all this heavy stuff. In VR, people complain [that] you have to put on this and you have to put on that, you have wear these goggles. Why can't you have unencumbered VR?"[365] Although the technology required to create a certain kind of immersion does require that encumbrance, Davies also frequently emphasizes that these virtual environments are *not*-nature, suggesting a possible interest in keeping the gear relatively burdensome lest the immersant grow too comfortable in the artificial realm. Again, these virtual environments are kept clearly distinct from the Real.

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[364] Artist and new media theorist Frances Dyson, discussed later in this chapter, argues that this thwarting of control is part of Davies' commentary on the "poorly equipped body rupturing the fiction of the perfect body that virtual embodiment implies." *Sounding New Media: Immersion and Embodiment in the Arts and Culture*. (Berkeley: University of California Press, 2009), 117. It is also reminiscent of Norbert Wiener's early experiments in cybernetics, where he conducted research on pilots using "deliberately sluggish control sticks" to establish a baseline for the sort of human behavior for which the machines would compensate. Galison, 236.

[365] Char Davies, quoted in Mark J. Jones, "Char Davies: VR Through Osmosis." Originally published in *Cyberstage* (Vol. 2.1, 1995). Archived online at http://www.bornyesterday.ca/cyberstage-archives/2011/3/23/char-davies-vr-through-osmosis.html.

The low resolution imagery also appears to be a deliberate choice, particularly compared to the resolution of the "tantalizingly good," as art historian Virginia Rutledge puts it, screen projection for viewers.[366] Laurie McRobert, whose book is the first full-length one to be written on Davies' work, writes that Davies has "come to value the 'low-resolution' quality of the images" produced by these HMD helmets, and "believes that the resulting softness or lack of detail causes the immersants to let go of their habitual reliance on sharply focused vision and begin to 'feel' space instead." McRobert continues that Davies has told her that if the latter "were to use HMDs with a much higher image resolution, she would no doubt add a 'compensatory' softening filter."[367] As far as the control—or lack thereof—in navigating the virtual space, Davies has made clear that unlike video games and more traditional uses of VR, she intends her projects to be less about *doing* than about *being*; the lack of any sort of simulated hand or tool with which to grasp or interact with the environment underscores this. In fact, the body is not represented at all within the computer-generated space; Davies emphasizes embodiment solely through the uniquely physical interface. One's physical body may be sweating and struggling in Real space, but Davies insists that the environment itself, coupled with one's physical interaction, leads to a meditative experience:

> After a certain period of immersion (usually about ten minutes), various conditions related to the imagery, luminosity, semitransparency, spatial ambiguity, slow subtle transitions between the worlds, evocative resonant sounds along with solitude, deep breathing and maintaining one's center of balance within the space all combine to create a distinct shift of awareness as he or she lets go of the rational urge to control, and boundaries between inner, outer, mind, body, space and time being to dissolve.[368]

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[366] Virginia Rutledge, "Reality by Other Means," in *Art in America* (Vol. 84, no. 6: 1996), 38.
[367] McRobert, 151, n. 3.
[368] Davies, quoted in Jennifer Cobb, *Cybergrace: the Search for God in the Digital World* (New York: Crown Publishers, 1998), ((PAGE #)).

One might wonder how much this "letting go" is due to aesthetics—and how much it may also be the deliberate or unintentional effect of an interface that is becalming and even antagonistic toward easy, direct navigation. Although Davies hasn't said as much, the uncertainties of the navigation seem, if not necessarily deliberate, at the very least conducive to that letting go she aims to facilitate. She has made it clear that she is aiming to subvert the conventions of the medium,[369] and less responsive "controls" would certainly contribute to such a subversion.

Subverting the medium

In 1991, years before she began work on *Osmose*, Davies submitted a paper to the "Virtual Seminar on the Bioapparatus," held at the Banff Centre for the Arts. At the time, Davies was the vice-president of SoftImage, a 3D graphics software company, and had begun using that software to produce her own digital imagery in the *Interior Body Series* (1990-1993) (fig. 24). Even at such a relatively early point, however, Davies was already thinking about the implications of using VR technology to create art. As she writes in her submission to the Natural Artifices panel:

> The technology associated with virtual reality is not value-free. Inherent in three-dimensional computer graphic tools are a host of conventions such as objective realism, linear perspective and Cartesian space, all of which tend to reinforce the Western scientific/mechanistic/dualistic worldview….For me, the challenge of working with this technology involves subverting its conventions and the ideology behind them in order to make images that can act as antidotes, reaffirming our organic participation *in*, rather than our separation from, the world.[370]

Later, Davies writes even more heroically of her use of this medium, claiming that she created *Osmose* and the later *Ephémère* "to serve as 'lighted lamps in a dark corner,' so

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[369] See, especially, Gigliotti, 65.
[370] In *Virtual Seminar on the Bioapparatus* (Banff: The Banff Centre for the Arts, 1991).

to speak, in terms of going beyond my own personal artistic agenda to demonstrate to others in the field that the medium of virtual reality could indeed be used for purposes other than reinforcing the dominant and conventional worldview."[371] It is instructive to look a bit more closely at the "dark corner" to understand Davies' metaphorical "lighted lamps."

Gibson's Cyberspace, though fictional, epitomizes the objective, Cartesian grid-oriented look of VR, where geometric blocks of data emerge from inky darkness. It's an aesthetic common to the actual VR that followed, which Mark Pesce, co-inventor of VRML (Virtual Reality Modeling Language), writes, "normally featured sharp-edged objects floating in a black void, looking like an amusement park of the mind's eye."[372] The amusement park simile is apt not just for the carnivalesque glow of the graphics and their bright colors, but for their orientation toward the viewer as objects with which to interact. The Pacific Science Center's hang-gliding VR presented its strongly geometric objects against a flat blue sky and green ground, and all buildings and fields strictly adhered to a grid that produced a precise linear perspective. Even this alignment of objects toward the viewer suggests, Davies argues, a particularly Western, dominating viewpoint, one which she attempts to modify through the spatial and atmospheric ambiguity of *Osmose.*

More than the hard edges of the graphics in traditional VR, Davies claims to subvert a medium that is, to return to her earlier statement, "not value-free." As Heilig alluded to earlier, VR technology was largely funded and developed not by Hollywood—

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[371] Davies, "Rethinking VR: Key Concepts and Concerns," in *Hybrid Reality: Art, Technology and the Human Factor,* Hal Thwaites, ed. (9th International Conference on Virtual Systems and Multimedia), Montreal, Canada: International Society on Virtual Systems and Multimedia (2003). Accessed online at http://www.immersence.com/publications/char/2003-CD-VSSM.html.
[372] Pesce, *The Playful World* , 251.

as might well have been the case, Rheingold suggests, had the vision and funding been in place—but by the military. This association goes clear back, Rheingold writes, to the "Link," a World War II-era flight simulator originally patented by Ed Link in 1929. Powered by pneumatics and providing visuals that evolved from a simple horizon line to later film and then video, the Link Trainer inaugurated generations of flight simulators that first prefigured VR and later benefitted from its technology.[373] Sutherland's HMD was produced with funding by ARPA and the Office of Naval Research,[374] and shifted simulation technology from the earlier camera model to use of computer-generated graphics.[375] Ed Link impressed his eventual army patrons by meeting them, on a day with terrible flight conditions, by flying in on instruments[376]—itself a sort of abstraction and virtualization of flying by looking at the ground. As aircraft instruments grew increasingly complex, Air Force engineer Thomas Furness III realized, as Rheingold puts it, that as pilots struggled to monitor their avionic information displays, they "were already operating in an artificial reality."[377] He and his colleagues designed an HMD, the Visually Coupled Airborne Systems Simulator (VCASS) that became the Super Cockpit program, an augmented reality system that combined graphical representation of information with the pilots' trained physical reflexes and abilities.[378] NASA, another governmental organization driven by similar martial (including Cold War) forces, was also prominent in the development of early VR, though, as "an impoverished bureaucracy," in Rheingold's words, its contribution was demonstrating "the feasibility

[373] Rheingold, 203.
[374] Ibid, 105.
[375] Ibid, 204.
[376] This story is related on the website of L-3 Link Simulation and Training, a company active today in providing VR flight simulators to the Air Force, and the direct progeny of Ed Link's Link Aviation Devices, Inc. http://www.link.com/history.html
[377] Rheingold, 205.
[378] Ibid, 205-8.

of near-garage-scale virtual reality [that] set off a wave of commercial and academic interest in the late 1980s."[379] Grau writes that the panorama, "ancestor medium" to immersive digital art, was originally designed as a tool for military reconnaissance, and, despite prompting concerns that "the illusion might permanently impair the capacity for perceiving reality," was quickly recognized as a tool for shaping public opinion.[380] Likewise, military backing was essential to the development of digital VR.

Military applications remain the largest use of VR today. A NATO report published in 2003 and summarizing extensive VR research and development in the United States and Europe affirms that "[Virtual Reality's] most important application domain is training. VR for training can reduce cost and risk of casualties and improve flexibility and performance monitoring. Furthermore, great opportunities are identified in the domains of planning and mission rehearsal, simulation supported operation, remotely operated systems and product design."[381] It is perhaps not surprising that these militaristic origins remain visible in many commercial virtual reality environments, as well as in the preponderance of popular "first-person shooter" (FPS) video games. The United States Army has even capitalized upon the popularity of such games, introducing their own *American Army* in 2002 as a recruitment and public relations tool. The game has enjoyed wide popularity, with its most recent version released in December of 2011.[382]

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[379] Ibid, 133.
[380] Oliver Grau, "Immersion and Interaction: from circular frescoes to interactive image spaces," *Medien Kunst Netz/Media Art Net/* vol. 1, edited by Rudolf Frieling and Dieter Daniels. (New York: Springer Wien, 2004), 295.
[381] North Atlantic Treaty Organization, *Virtual Reality: State of Military Research and Applications in Member Countries*, Research and Technological Organization report 18, AC/323(HFM-021), 2003. CD-ROM.
[382] America'sArmy.com, "Version History." http://www.americasarmy.com/intel/versions.php?id=38#readme.

These FPS and other first-person POV games, are not, with few exceptions, played in VR format. Instead, players utilize computer monitors or televisions for the visual, speakers or headsets for the audio, and game controllers or keyboards for avatar control. The graphics, when displayed through an adequately equipped game system or computer on a high-resolution screen, are spectacularly clear; the control immediate; and the experience certainly immersive, often occupying users for many hours on end.[383] Games like *L.A. Noire,*[384] with its cinematic narrative, characters animated using MotionScan technology that captures every nuance of an actor's expression, and elaborate reconstructions of period architecture, blur the distinctions between movies and games (fig.25). Games played on Microsoft's Xbox 360, which allows users to view scenes not just from a single, fixed POV, but, as the title suggests, a range of vantages, allow the player to be actor, viewer, and director at once, in a strikingly visually realistic virtual world.

The increasing realism of video games, as well as of special effects in film, is, perhaps somewhat ironically, indebted to the work advanced by Davies and Softimage. Softimage produced software that, as Pesce puts it, "allowed artists to create 3-D computer graphics without a deep knowledge of mathematics and computer programming."[385] Founder Daniel Langlois, himself an artist and designer, began developing the software in 1986 after experiencing firsthand the "torturous process" that at the time characterized 3-D animation, and wanting a tool that was more intuitive for

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383 Nick Yee reports that players in the video game genre known as massively multiplayer online role-playing games (MMORPGs), on average 26 years old, spend an average of *22 hours per week* in these online virtual environments. "The Labor of Fun: How Video Games Blur the Boundaries of Work and Play," *Games and Culture* 1, no. 1 (2006):69.
384 Team Bondi. New York, NY: Rockstar Games, 2011.
385 Pesce, "Cathedrals of Light,"

artists. Davies helped him finance the endeavor by introducing him to investors in Toronto, and joined the tiny start-up as a founding director in 1987. [386] She served as Softimage's first vice president from 1988-1994 and director of visual research from 1994-1997.[387] The company soon vaulted to success, acquired by Microsoft in 1994 after the former's Creative Environment software fueled the effects in films *Terminator2: Judgment Day* (1991), *The Mask* (1993), and *Jurassic Park* (1994). The effects George Lucas' Industrial Light & Magic (ILM) created for the latter were heralded as "a quantum leap forward in computer-generated graphics, one that will forever change the way movies are made."[388] As Langlois put it mildly in a press conference, "It's an exciting time for computer graphics. [In *Jurassic Park*] the quality of the graphics is perfectly integrated into the 'real' film footage; you can't tell what's real and what's not."[389] Credit for this realism is shared by Davies, who says of her role:

> I feel it's really important that along with pure technological development, there's another development that goes alongside in terms of aesthetics and content. My role in visual research is to "push" the tools in terms of their expressive capacity. If this technology is to convey a full range of human emotion, then its aesthetics should be evolving along with the actual code.[390]

Pesce, a passionate Davies devotee, is even more expansive about her contribution, writing, "One reason everything on screen looks so real is that — in the earliest days — an artist judged each effort against a private standard of visual fidelity."[391] Pesce credits

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[386] Merle MacIsaac, "Wizard of Awe. (Cover Story)," *Canadian Business,* 67 no. 12 (December 1994): 28. *Academic Search Premier*, EBSCO*host* (accessed July 9, 2012).
[387] Davies, "Biography." www.immersence.com.
[388] Michael Karol, "It came from ... inside a computer: computer software generated dinosaurs so realistic you'll swear you're back in the Jurassic era," *Graphic Arts Monthly* Oct. 1993: 62+. *Expanded Academic ASAP*. Web. 9 July 2012.
[389] Ibid.
[390] Jones, n.p.
[391] Mark Pesce "3-D Epiphany," *Salon Magazine*, (June 13, 1998). /www.salon.com/1998/06/13/feature947640934/.

Davies not just with using computer technology to create a rich and expressive aesthetic project, but with infusing the technology with those characteristics from its inception.

What, then, is the nature of Davies' subversion of the medium, of her bringing the proverbial lit lamp to these dark corners? Certainly the interface is one that strives for a more fully embodied experience than the simple goggles and glove or game controller, and control itself is thwarted in favor of a more contemplative "being." The ambiguous, transparent imagery explodes Cartesian space, revealing perspective to be merely a fickle illusion. The space itself has a different "feel"; as opposed to polygons or wireframes against empty darkness, Davies' diaphanous, ambiguous imagery strives for, as she puts it, "a sense of lived, felt space that encircles one with an enveloping horizon and presses closely upon the skin"—one very different, needless to say, from the necessarily precise flight simulators or war games that preceded it. Her focus is on solitude, rather than virtual collaboration. Her subject matter is Nature (albeit transformed), rather than futuristic technology. It does, indeed, diverge significantly from the VR projects that have preceded it.

The subversiveness of the project as a whole, however, remains somewhat questionable, particularly given its corporate sponsorship. Davies shares production credit and copyright for *Osmose* with Softimage, which provided not just the software, but other tangible support. As science writer Margaret Wertheim points out, Davies had access to "a full-time programmer and computer animator, plus a Silicon Graphics Onyx2 Infinite Reality supercomputer, the Porsche of graphics computers"[392]—or, as the Baltimore Sun put it in 2000, "one of the most powerful supercomputers ever engaged for

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[392] Margaret Wertheim, "Worlds Apart: Realities, Virtual and Otherwise," *L.A. Weekly* (May 16, 2001) Date Accessed: 2012/07/10. http://www.laweekly.com/2001-05-24/art-books/worlds-apart/.

nongovernmental work."[393] Although *Osmose* and *Ephémère* were ported to PC interface in 2002, at the time of their creation, running such a complex program required massive computing power: the Infinite Reality, as well as a separate Macintosh computer just to run the sound synthesizers and processers.[394] This also made exhibiting the projects, in which only one person can be immersed at once, an expensive endeavor. In Wertheim's words, this makes *Osmose* and *Ephémère* "an essentially elite experience, one made possible by the largess of a rich patron—in this case, the artist herself."[395]

As for the patron herself, she describes her use of the computer as an artistic medium as a natural outgrowth of the painterly practice and aesthetic that she had been cultivating for years, and her joining with the Softimage team as a prescient move that would ultimately allow her to realize her full vision. As she puts it:

> The limitations of painting's two-dimensional picture plane… became increasingly apparent to me, as did the medium's limited capacity for suggesting envelopment within that space. I began looking for a more effective means of visualization…. The desire to work in [a 3D graphics] space led me on a bit of a detour in terms of my work as an artist, namely that of building the 3D software company, Softimage. I became a founding director in early 1988.[396]

This rather heroic biography, propagated perhaps most admiringly by Pesce, describes Davies as sacrificially "set[ting] aside her successful career as a painter to become a founding director of a tiny start-up computer graphics company," where she "worked nonstop, [until she] finally took a few weeks off"—and had the experience, while diving,

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[393] Frank D. Roylance, "Sky is no Limit at New York Museum," *The Baltimore Sun* (February 13, 2000) http://articles.baltimoresun.com/2000-02-13/news/0002130175_1_sphere-space-theater-hayden-planetarium.

[394] www.immersence.com/osmose/ and www.immersence.com/ephemere/.

[395] Wertheim, n.p.

[396] "Interview with Char Davies," *Hyperanimation: Digital Images and Virtual Worlds*, Robert Russett, Ed. (Bloomington: Indiana University Press, 2009), 188.

that inspired *Osmose*.[397] Unlike Laurel and Strickland's project, which involved, and listed, dozens of collaborators, *Osmose* and *Ephémère* tend to focus almost exclusively on the Artist. Even when Davies writes, as she did in her unpublished dissertation, about her collaboration with the team that actually produced the projects—3D graphic artist and animator Georges Mauro, computer programmer John Harrison, "sonic architect" Dorota Blaszczak, and sound composer Rick Bidlack—she emphasizes their "empath[y] with my thematic intentions and also my visual sensibility." As she puts it, "The commitment by these individuals to my overall vision was crucial to the fruitfulness of our work on *Osmose* and subsequently *Ephémère.* Equally important was their understanding and respect for my creative process…."[398] For Davies, these projects are clearly less collaborations than the creations of a master artisan, assisted by her workshop—an image that evokes, despite the cutting-edge technology that produced *Osmose* and *Ephémère*, a far older model of artistic production.

This anachronism extends, finally, to Davies' descriptions of the pieces' particularly feminine aesthetic, in clear contrast to what she sees as an overtly masculinist technology with its "testosterone dreams" of achieving disembodiment in virtual space. Although *Osmose* and *Ephémère* represent state-of-the-art technology, Davies' own descriptions tend toward the simplistic and essentializing. *Osmose* eschews a joystick, which Davies calls, in a 2002 interview with her dissertation advisor, Carol Gigliotti, "so obviously phallic it makes me laugh."[399] Instead, in the same interview she describes the

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[397] Mark Pesce, *The Playful World: How Technology is Transforming Our Imagination* (New York: Ballantine Books, 2000), 248-9.
[398] Davies, "Landscapes of Ephemeral Embrace: A Painter's Exploration of Immersive Virtual Space as a Medium for Transforming Perception" (PhD diss., University of Plymouth, 2005), 150, http://hdl.handle.net/10026.1/353.
[399] Gigliotti, 65

space of *Osmose*—navigated through the more intimate interface of breath and body—as a close, "sensuous space, subjectively, bodily perceived." She continues, "Some might interpret this as a uterine or womb-like space. Perhaps the desire to recreate, to communicate this sensibility, my sensibility, of such space is because I am female: I would leave that up to interpreters of my work."[400] When asked in a 1999 interview whether she thought that *Osmose* had a "feminine subjectivity," Davies agreed that she did, continuing, "How I experience space and time is very much shaped by my being embodied as female in this life—and this sensibility has no doubt shaped my approach to the technology."[401] This privileging of a "feminine sensibility" and a focus on the female body as a subject of art made by women hearkens to an earlier period in art history, and particularly to the body-centric art of the 1970s. This art sought a unifying feminine aesthetic resulting from an essential core common to all women, and thus discernible in women's art. *Osmose* does not feature explicitly vaginal imagery to express and celebrate a perceived inherent femaleness, as did such 1970s pieces as Judy Chicago's *The Dinner Party* (fig. 26). However, the reference to an unproblematic "feminine subjectivity" does seem somewhat anachronistically essentializing, particularly given the lively theorization of gender in the 1990s, when *Osmose* was developed.

Posthuman Imaginings—and Failures

As discussed in Chapter 1, in *How We Became Posthuman*, Katherine Hayles identifies as a key characteristic of the posthuman mindset the science-fictitious imagining of the human as seamlessly interfaceable with the computer. The mind, in this imagining, is analogous to a computer, thought to data, and the body simply to the

[400] Ibid, 64.
[401] Karl O'Donoghue, "The Real and the Virtual: Karl O'Donoghue Interviews Char Davies," *Art Bulletin*, Vol. 16 (87) (June/July 1999)

hardware (or "wetware") that houses and transports it. It is this rhetorical software, to return to Richard Doyle's useful phrase, that undergirds cyberpunk imagery, from an individual abandoning his body for the "bodiless exultation of cyberspace," to sharing the physical sensations and POV of another's body,[402] or even to being uploaded entirely into a purely virtual realm. Hayles has no interest in glorifying the liberal humanist subject, against whom she poses the disparate figure of the posthuman, but she does argue against what she calls "the erasure of embodiment."[403] Minds require bodies, and human thought, as philosopher Jean-François Lyotard argues, is a product of, and thus fundamentally dependent upon, human bodies.[404] An experience in even a virtual world is still only possible through embodiment.

In some ways, a virtual space that requires physical embodiment for immersion and navigation would seem to present an ideal model of posthumanism, one that repairs a false Cartesian dualism that would cleave mind from body, while blurring boundaries between the biological and the technological, the natural and the artificial, the virtual and the real. Instead, however, *Osmose* and *Ephémère* are interesting precisely for their refusal to do so, and for the boundaries they instead reinforce. This failure becomes even more salient with the benefit of nearly two decades' hindsight and in light of the direction communications and imaging technology have since taken. Today's focus is not on virtual environments that seal out the so-called Real, but that mesh seamlessly with it..

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[402] In *Neuromancer*, Case is able to access, via her "simstim" uplink, Molly's sensorium, and as a "rider," experience everything she does, alongside her. During one coordinated mission, he flips between simstim and cyberspace—and, when Molly is wounded, her physical agony and bodilessness.
[403] Hayles, xi.
[404] Jean-François Lyotard, "Can Thought Go On Without a Body?" *Postumanism,* Neil Badmington, ed. Houndmills: Palgrave, 2000.

Osmose and *Ephémère* fail to immerse—particularly now, but also perhaps nearer the time of their own creation. Artist and new media theorist Frances Dyson describes her own experience of the projects as a frustrating one, with the interface, rather than disappearing, "all too present"—at the same time it rendered her essentially unable to navigate within the virtual space.[405] Margaret Morse, a professor of film and digital media, recounts a similar difficulty in navigating *Osmose,* describing her experience as not so much "profound" as "an occasion for panic." As an individual with asthma and a phobia of math, the seemingly underwater environment made her "deeply and instantly afraid," and her inability to escape the scrolling Code world prompted even more anxiety.[406] (It's interesting to note that in Morse's case, although *Osmose* doesn't produce the desired *effect*, it certainly prompts an affective response—in this case, her physically manifested anxiety.[407]) Dyson suggests that more individuals may have had similarly less-than-transcendent experiences, writing, "It is unfortunate that anecdotal testimonies like my own and Morse's were probably not recorded in the comments book placed on the podium at the exit of *Osmose's* premiere, since the abject failure of virtual embodiment of which they speak may have muted some of the more wildly mystical comments that came to represent Davies's work."[408]

Although the works are undoubtedly very highly acclaimed, certainly not everyone was transported, particularly in later shows, by which point the equipment was becoming rather worn, such as SFMOMA's "010101." Jason Spingarn-Koff begins his 2001 *Wired* review of Davies' pieces in that show with the observation that her projects "transport

[405] Dyson, *Sounding New Media,* 117.
[406] Morse, *Virtualities: Television, Media Art, and Cyberculture.* Indiana University Press, 1998. *eBook Collection (EBSCOhost)*, EBSCO*host* (accessed July 13, 2012), 208-209.
[407] I am particularly indebted for this observation to Jane Blocker.
[408] Dyson, *Sounding New Media,* 117.

users into a magical world—and elicit some very strange responses," following which he recounts Davies' story of a woman who burst into tears and, when asked why, responded, "Because I am so happy. I feel really happy to be alive." He describes other claims Davies makes about the pieces: that the "peaceful, disembodied experience often produces a sense of astonishment," that "for the first minute or two after taking off the helmet, some people can't even speak," and that "on several occasions, people have told her they cried." Spingarn-Koff describes his own experience rather more dimly, writing that being immersed—especially compared to watching the higher-resolution images on the public display—"can feel like you're sticking your eyes against a television set." He quotes fellow critic David Littlejohn of the *Wall Street Journal*, who said he preferred to watch the former display than to "get strapped into all the gear and look at it through fuzzy goggles, even if you were led to believe you had something to do with creating what you saw. Most 'interactive' stuff I've fiddled with so far seems pretty transparent in its maker-designed manipulation."[409] Littlejohn's own review of "010101" dedicates a single, tepid sentence to Davies' pieces: "In a dark chamber, I donned the wired helmet and vest required to 'immerse' myself into Char Davies's 15-minute virtual environment, in which movements of the head and body influence the floating, surreal world one perceives."[410] He suggests that not only the inadequate visual quality, but the inability to explore freely, prevent these pieces from truly immersing.

The clumsiness of the interface and low quality of the graphics stand in striking contrast to today's entertainment media. Video games for the Xbox 360, discussed above,

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[409] Jason Spingarn-Koff, "Nature Doesn't Look Like This," *Wired*, March 3, 2001. http://www.wired.com/culture/lifestyle/news/2001/03/42151.
[410] "Invasion of the Cyber Geeks," *The Wall Street Journal,* March 13, 2001. http://online.wsj.com/article/SB984443310341647524.html.

immerse through engaging cinematic narratives (as in *L.A. Noire*) and vivid, high-resolution imagery. Nintendo's Wii video game system (fig. 27), released in 2006, allows users to interface with the game through a wireless wand that can be freely moved in space. The wand not only allows users freedom of motion, but provides haptic feedback that further enhances the sensation of being fully, physically in the game world. Finally, Microsoft's 2010 Kinect console for the Xbox 360 does away with the controller altogether, using a camera and microphone to capture and respond directly to users' physical gestures and voice. Unlike *Virtual Hoops*, Kinect games (of which basketball is one—along with tennis, bowling, yoga, dance and more) do not require a blue screen, and can be played by more than one player at once (fig 28). The Kinect has experienced wide success, capturing the Guinness World Record as the "fastest-selling consumer electronics device" after it sold eight million devices in 60 days,[411] and introducing a newly physical dimension to the traditionally sedentary video game medium.[412]

Osmose and *Ephémère*, with their low-resolution graphics and cumbersome interface, not only fail to immerse, but fail to challenge the dualistic binaries they would overcome. Davies emphasizes that with these pieces she's challenging VR as "the epitome of Cartesian desire[;] a place of the mind, where the body is denied, a place where humans have total control." As we've seen, the pieces certainly challenge total control, whether via the interface that thwarts the ability and desire to reach certain locations in the virtual world, or through the transparent, ambiguous imagery that challenges the viewer's sense

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411 BBC. "Microsoft Kinect 'fastest-selling device on record,"' March 10, 2011. **http://www.bbc.co.uk/news/business-**12697975

412 In May of this year, the President's Council on Fitness, Sports, and Nutrition even partnered with Xbox and Wii to include certain active games among those that counted toward the Presidential Active Lifestyle Award (PALA+). See Lenny Bernstein, "President's Council on Fitness Backs Wii, Kinect, and other video games," *Washington Post* (May 15, 2012). http://www.washingtonpost.com/lifestyle/wellness/presidents-council-on-fitness-backs-wii-kinect-and-other-video-games/2012/05/14/gIQAJg87QU_story.html and The President's Challenge Program, https://www.presidentschallenge.org/challenge/activities.shtml.

of space as (in traditional VR's depiction) rational, logical, and oriented toward the viewer's commanding gaze. The idea of traditional VR as particularly Cartesian, as far as seemingly splitting mind from body, is supported by language such as Gibson's description of the "bodiless exultation of cyberspace," or even by Paul's insistence to Jamie that he "didn't do anything": that the virtual didn't count, because the experience was in the mind rather than the body.

Davies' solution to this mind-body split is to make navigation dependent, not on a manipulable "hand," but on the movements of the body's core—to make the immersant aware of one of the most fundamental aspects of being alive and embodied: breathing. She describes *Osmose* and *Ephémère* as providing "full body immersion," and her work as trying to create "a sense of lived, felt space that encircles one with an enveloping horizon and presses closely upon the skin."[413] However, an HMD, no matter the degree to which the display wraps around the head, added to a torso-based navigational interface, does little, it seems, to challenge the Cartesian mind-body dualism that appears to inhere in VR. The entirety of the projects' sensory input—imagery and sound—is delivered via the HMD. Although the requirement that one lean and inflate one's chest may make one more aware of one's body outside of the virtual space, there is no less a disconnect between mind and body than in any simulation that primarily engages the senses of sight and hearing. Since one's primary experience of the virtual worlds is, as in more traditional VR, visual (regardless of the tactility Davies describes), and since the body isn't visible at all within the virtual worlds, it is difficult to see *Osmose* and *Ephémère* as doing much to challenge, in practice, a Cartesian dualism.

[413] Gigliotti, 64.

This dualism of mind and body in the virtual world also suggests a sort of originary oneness in Nature, against which Davies poses the Technological of *Osmose* and *Ephémère*: the natural, whole body exists in the former, even if necessarily split in the latter. Although both projects draw from natural imagery, in emphatic contrast to a hard, geometric, *Tron*-like aesthetic, Davies insists that they are not an attempt to replicate, and definitely not to replace, Nature itself, and is clear about the distinction between it and technology:

> I don't believe, as some in the field do, that nature is an outmoded metaphor and that the sooner we can recreate ourselves through silicon and genetic engineering, the better off we'll be—and when we have fused our brains with our machines we can leave this spoiled planet for virgin territory elsewhere. This is a testosterone dream… I want no part of it, and I guess that's where my female sensibility comes in. In my work, I'm attempting to *reaffirm* the role of the subjectively-lived body. Rather than deny our embodied mortality and our material embeddedness in nature, I seek, somewhat paradoxically, through a highly technologicalized art form, to return people to their bodies and to the earth by using VR to *refresh* their own perceptions of an embodied being-in-the-world, to return them to a perceptual wonder at being here.[414]

Not only is Nature here clearly delineated from Technology, but the former is rather simplistically associated with a "female sensibility," and the latter with a "testosterone dream." In describing *Ephémère* as "a lament, not only for the ephemerality of our own lives, but for the passing of Nature as we have known it," she links human life and death to the cycles of nature, while also seeming to suggest an Edenic Nature somehow separate from humanity. Although Davies clearly aims to dissociate her own projects from the idea of VR as disparaging the body as merely meat in a brave new virtual

[414] Ibid, 66.

world—the time and sentiment Arthur Kroker has dubbed "the flesh-eating 90s"[415]—her depictions of both technology and gender seem anachronistically non-nuanced.

Indeed, what *Osmose* and *Ephémère* offer is not the blurring of boundaries suggested by posthumanism, but instead very safe, clear-cut, versions of gender, immersion, technology, body/ machine interface, and the virtual. Even as they experience the virtual worlds, immersants are literally and metaphorically tethered to a particular "real." This real enjoys a cameo in the form of digitally imported texture in *Osmose*'s leaf, which, Davies is quick to point out, represents "the only use of the 'real' in the entire work, [while] all else is digitally constructed."[416] It is important to her to emphasize that the virtual worlds of *Osmose* and *Ephémère* are *not* real, just poor reflections of the Real of Nature she would urge immersants to explore instead.[417] No one, certainly, would confuse the two; as Grau points out, "Even six-year-old children are able to distinguish between realty and 'as-if worlds,'[418] and the HMD and gear one must wear to explore the virtual worlds are not exactly easy to forget. Unlike those immersed in Cyberspace, the Metaverse, the Matrix, or even the Cybercinetic, Davies' immersants experience a very small, tightly controlled space (computing power an unavoidable necessity and limiting factor in 1994's physical reality), with few options for interaction with the

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[415] Arthur and Marilouise Kroker, *Hacking the Future: Stories for the Flesh-Eating 90s*. New York: St. Martin's Press, 1996.
[416] Davies, "Virtual Space," *Space: In Science, Art, and Society*, François Penz, Gregory Radick and Robert Howell, eds. (Cambridge: Cambridge University Press, 2004), pp. 69-104. Online at http://www.immersence.com/publications/char/2004-CD-Space.html.
[417] Davies says, "*Osmose* will have fulfilled its purpose if it makes people want to go diving." Quoted in Frances Dyson, "Charged Havens," *World Art* (no. 3, Fall 1996), 45.
[418] Grau, "Immersion," 301. Grau cites Fisher and Watson, "Differentiation of Fantasy and reality," in *Developmental Psychology*, 2, 1988, pp.286ff.

environment—and none with other individuals. And although the memory of the experience may linger, her immersants undertake little to no physical or mental risk.[419]

Nonetheless, Davies' insistence, spoken and unspoken, that her projects stand in contrast to the Real world, enacts less a comingling of body and machine than a reinforcement of their absolute separateness. The body is not visible in the virtual world because there, it doesn't exist. The body, for Davies, must remain outside the virtual, firmly anchored to the Real. Navigation of *Osmose* and *Ephémère* isn't even possible without the split awareness that the physical body exists somewhere separate from the world one sees and hears through the HMD—in an outside emphatically demarcated from the virtual inside. In contrast to science-fiction imaginings, this making real of virtual worlds, dependent on the real physical body, demonstrates the limits of VR, even as, with maximum computing power and unprecedented visuals, it represents the medium's greatest achievement.

The Internet and non-VR immersion

Even as Davies pushed VR to its limits, however, perhaps taking satisfaction in demonstrating those shortcomings, most others were abandoning the medium—and had been, as Laurel suggested in 1993's "Post-Virtual Reality," for a while. A new communications technology was beginning to take center stage: the Internet. Arising from a network originally developed by the military—notably the network of the DoD's ARPA, which had also funded Sutherland's HMD research and development—the Internet began to gain widespread popularity in the early- to mid-1990s as households used modems to connect through their telephone lines. One of the first of these online

[419] Dyson describes a "somewhat intimidating disclaimer that the viewer had to sign… a legal document, which freed both artist and sponsor from any responsibility for the surprisingly long list of medical conditions that experiencing *Osmose* might activate or upset." *Sounding New Media,* 109.

services was Prodigy®, which connected users to its own content before becoming a true Internet Service Provider (ISP) in 1994 and allowing access to the World Wide Web. Although Prodigy did offer some games—including the popular “Mad Maze” (fig. 29), which a player navigated through a first-person view—the real allure of the Internet, and its true immersive power, came not through its ability to provide striking visuals (which were nonexistent in the early days), but through its ability to connect individuals with a wide web of human contacts and information, through features such as bulletin boards and chat.

What the Internet offered was a different kind of virtual reality: a sort of parallel universe, in which, as Sherry Turkle wrote in *Life on the Screen*, individuals can construct alternate identities formed for, and through, interactions with other individuals linked by the Web.[420] This reality proved thoroughly immersive even in the absence of the computer graphics that did continue to grow ever-more realistic. The Internet was the manifestation of decades of science-fiction imagining; it is appropriate that this parallel universe came to be known by the moniker Gibson gave his imagined data world: cyberspace. If Gibson’s impressionistic descriptions of Cyberspace, focusing on data and code, evoke the early days of the Internet; and the interactive, online MUDs (multi-user dungeons) with the text-based role-playing Turkle describes fall somewhere in the middle; Stephenson’s Metaverse is perhaps closest to today’s reality.

In fact, the Metaverse was of direct inspiration to Philip Rosedale, the creator of the online community Second Life (SL), which today hosts a massive number of registered

[420] (New York: Simon & Schuster, 1995).

"Residents" and has an economy worth millions of real-world dollars.[421] As Rosedale told National Public Radio reporter Laura Sydell in a 2010 interview, regarding Stephenson's novel, "You looked at that and you said, well, we could actually do that. There's not really a whole lot of reasons why we couldn't actually do what's in that book"—that is, once technology caught up in the late '90s.[422] Rosedale founded Linden Labs in 1999 and launched SL in 2003, a virtual world that he describes as beginning with just a small island with trees, but which soon filled with entirely user-created content, including avatars of all shapes and forms.[423] This content is created, Resident Asri Falcone explains in the 2012 documentary *Life 2.0*, by using "primitives," basic building blocks that can be cut, twisted, hollowed out, and joined together. "Anything you can think of," she says, "you can actually build" (fig. 30).

The documentary follows Asri, who designs clothing and houses in SL (and successfully pursues a lawsuit when another resident steals and resells copies of her items); Aaya Aabye, an 11-year old girl avatar and the adult man behind her; and the couple Bluntly Bertinger and Amie Goode, who meet in SL and attempt to translate their online relationship into "first life"—at the expense of their extant marriages in the latter (fig. 31). Asri reports spending 15-20 hours per day in SL, and the anonymous man behind Aaya says that the night he discovered SL, he didn't sleep all night—a pattern that would continue, to the eventual detriment of his physical health and relationships. "[SL] feels real, it feels like real life," he says, "…and life takes time." This intense immersion

[421] Second Life doesn't consistently release statistics on their current users, but the 2012 documentary *Life 2.0* describes a striking trajectory of registrations: SL launched in 2003 and by 2007 had 7 million users; by 2008, 15 million, and 2009, 19 million. Jason Spingarn-Koff (New York, NY: Virgil Films & Entertainment, 2012), DVD.

[422] Laura Sydell, "Sci-Fi Inspires Engineers to Build Our Future," *Weekend Edition* (Washington, D.C.: National Public Radio: August 21, 2010). http://www.npr.org/templates/transcript/transcript.php?storyId=129333703

[423] *Life 2.0*.

stems not, it seems, from the visual realism of the world (where the graphics suffer from jagged anti-aliasing; time lag; and physical oddities, especially at the articulation of joints), but from the real-time interactions it facilitates.

And this is the direction, as hindsight clearly reveals, in which technology has moved in the decade and a half since Davies's last VR project. Today, VR is still used in highly specific applications, such as simulators for flight and medical training, but has not swept the entertainment industry as was predicted at its inception. Today's video games immerse through their graphics, and, in the case of the Kinect, an interface that has literally disappeared. Yet the absence of ubiquitous personal VR gadgetry or even the fact that the majority of the population still isn't Second Life Residents doesn't mean that we aren't still intimately connected with, and immersed in, the virtual world. Indeed, the virtuality has become even more tightly enmeshed with reality. In his 2010 book *Reality Hunger*, author David Shields identifies a trend in contemporary arts and entertainment that doesn't distinguish between so-called fact and fiction, but instead revels in their intertwining and indiscernibility. He bemoans what he considers outmoded strictures of "truth" telling in memoirs, and argues that the most compelling art, in all formats, is simultaneously reality and non-reality. I would argue that this indeterminate mingling of fact and fiction parallels today's experience of virtuality and reality, and characterizes the posthuman environment.

Conclusion

The increasing imbrication of the virtual and real worlds is due, in large part, to increasing access to cyberspace. In 1999, when she wrote *How We Became Posthuman*, Hayles claimed that 70% of the world's population had never made a telephone call.[424] As of the end of 2011, the International Telecommunication Union reported that not only did "70% of the total households in developed countries [have] *Internet*," but that "mobile-cellular subscriptions reached almost 6 billion…, corresponding to a *global penetration of 86%*" (emphasis added).[425] In the United States, smartphones (those mobile phones that have Internet accessibility and are equipped with additional software functions) recently overtook, as I mention in the first chapter, so-called dumbphones as the majority among mobile phone subscribers.[426] One needn't spend long with one of these smartphone users to realize the immersive power of these tiniest of personal computers. In addition to communication via voice and text, these handheld devices offer access to social networks, Web searches, games, and videos—a nearly insurmountable source of distraction for many of their owners, from in-person interactions and activities such as walking and driving. For some, the use of these devices even becomes an addiction.[427]

In the opening scene of *Osmose*, a grid stretches into infinity around the user, a web of semitransparent filaments extending into the blackness of space (fig. 31). In *Osmose*, this grid, ideally having achieved its goals of orienting the immersant in the virtual space and evoking impressions of traditional VR's Cartesian aesthetic, fades into the softer, filmier layers of "womb-like space." The immersant remains in a stable, if ambiguous,

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[424] Hayles, 20.
[425] International Telecommunication Union Data Release, June 2012. http://www.itu.int/ITU-D/ict/statistics/material/pdf/2011%20Statistical%20highlights_June_2012.pdf The ITU is a specialized agency of the United Nations.
[426] Nielsen, "America's New Mobile Majority: A Look at Smartphone Owners in the U.S." http://www.nielsen.com/us/en/newswire/2012/who-owns-smartphones-in-the-us.html
[427] For more on the addictive potential of smartphone usage, see Bong-Won Park and Kun Chang Lee, "The Effect of Users' Characteristics and Experiential Factors on the Compulsive Usage of the Smartphone," Communications in Computer and Information Science, 2011, Volume 151, 438-446, DOI: 10.1007/978-3-642-20998-7_52; and Adriana Bianchi and James G. Phillips, "Psychological Predictors of Problem Mobile Phone Use," *CyberPsychology & Behavior* (Vol. 8, no. 1: 2005), 39-50.

space, safely tethered to the imagery-generating computer by an umbilical cable. This virtual realm is solitary, eventless, and distinctly non-Real, offering what some claim is a halcyon, even transcendent experience, but which my own experience suggests is an engaging idea that functions more effectively as concept than reality.

It's not just the heavy equipment, awkward interface, or lo-fi graphics that make *Osmose* and *Ephémère* feel particularly dated: it's the insistence on the virtuality of the projects (and the clear-cut distinction from the Real) and the limitedness of this particular virtual. The contrast with today's wired milieu is striking. The virtual, in the form of digital projections and communications, is ubiquitous, and accessed not in highly-specialized, tightly-encapsulating get-ups, but through devices that allow it to be layered over and augment the "real" (the latter an increasingly moot distinction). In today's wired milieu, the grid remains, not always visible, but tightly linking individuals with their machines, each other, and even political forces and corporations in an interconnected web. In the next chapter, I examine what comprises this web, and how performances by Australian artist Stelarc work to make it visible.

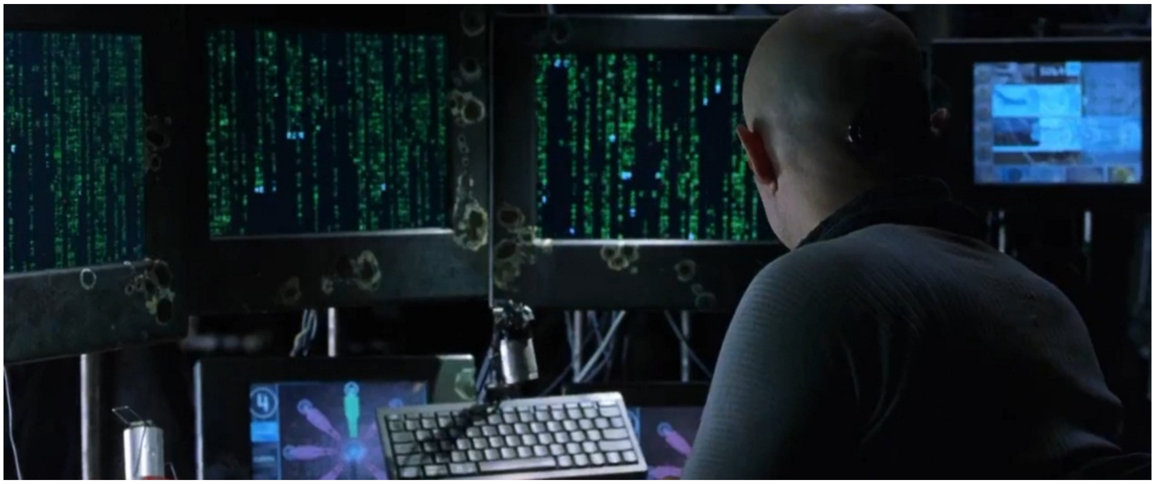

Figure 3.1*The Matrix* screenshot, showing one of the operators (with cranial port visible) watching the encoded Matrix.

Figure 3.2 *Mad About You* screenshot, 1994.

Figure 3.3 ***Mad About You*** **screenshot, 1994.**

Figure 3.4 ***Mad About You*** **screenshot, 1994.**

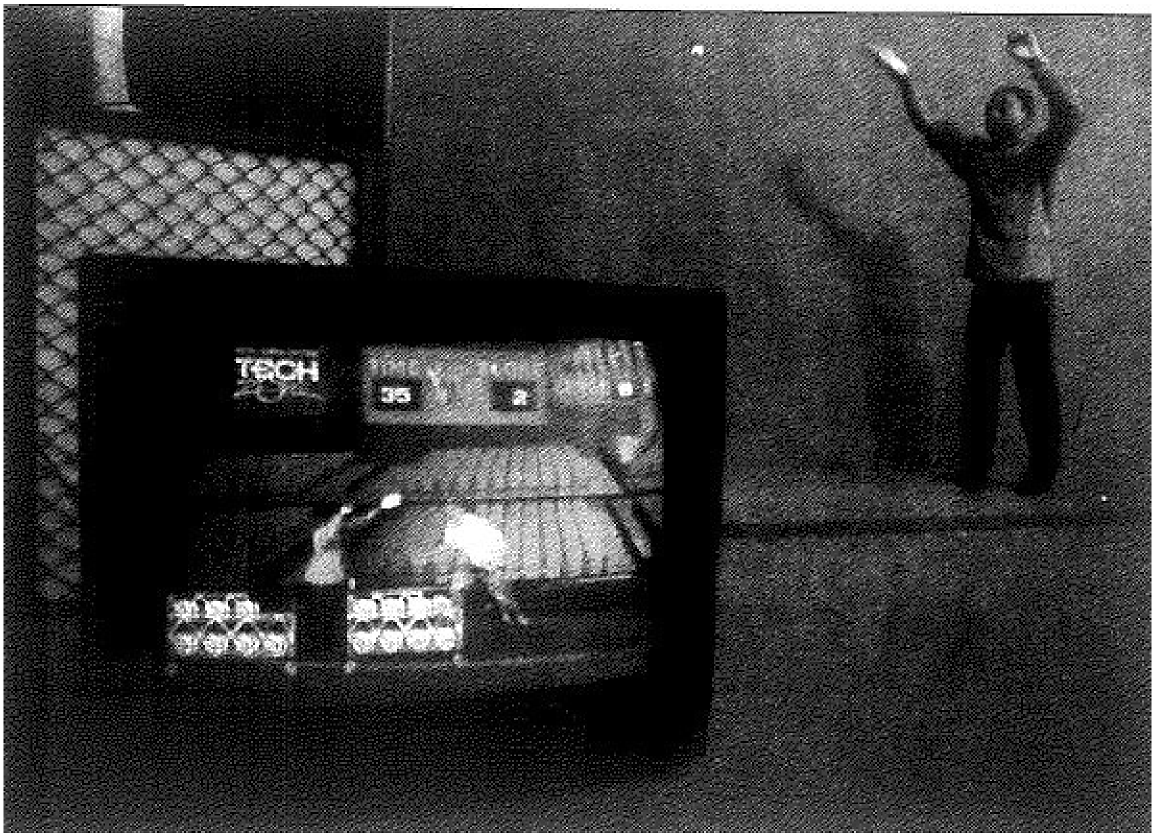

Figure 3.5 ***Seattle Times*** **caption: "Erroll Knight, 11, a fifth-grader at Beacon Hill Elementary, plays 'virtual hoops' on a television screen, part of the new Tech Zone interactive exhibit his class previewed at the Pacific Science Center." March 5, 1994.**

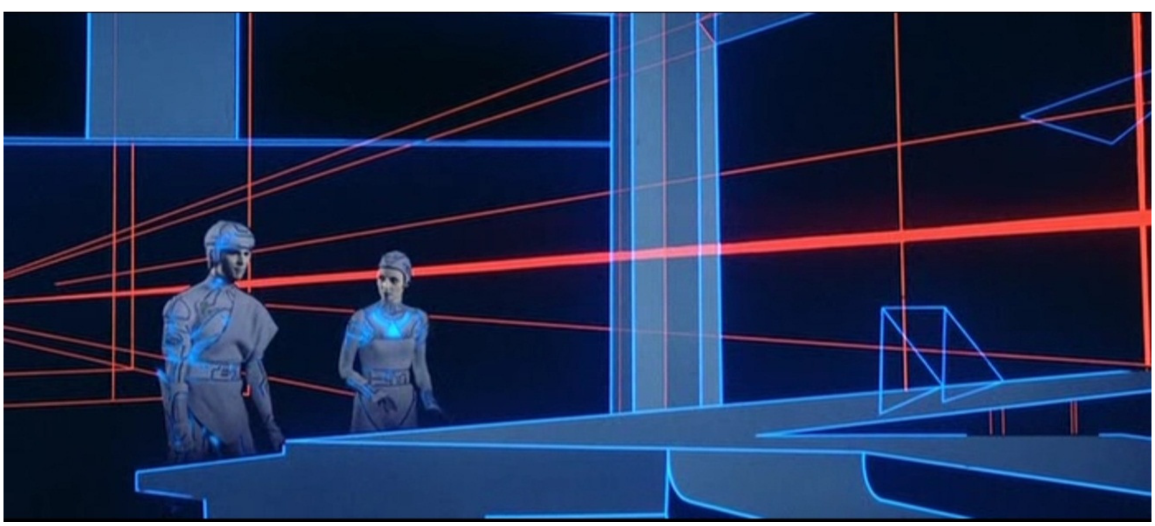

Figure 3.6 ***Tron*** **screenshot. 1982.**

Figure 3.7 Chicago: World's Columbian Exposition, 1893: Ref.: stereoscope viewer & cards (UCSD, via ArtStor)

Figure 3.8 William Horner, Zoetrope, 1834. Picture from North Carolina School of Science and Mathematics. http://www.dlt.ncssm.edu/collections/toys/html/exhibit10.htm

Figure 3.9 Poster advertising Morton Heilig's *Sensorama*. (From http://www.telepresenceoptions.com/2008/09/theory_and_research_in_hci_mor/, courtesy of Scott Fisher Telepresence.)

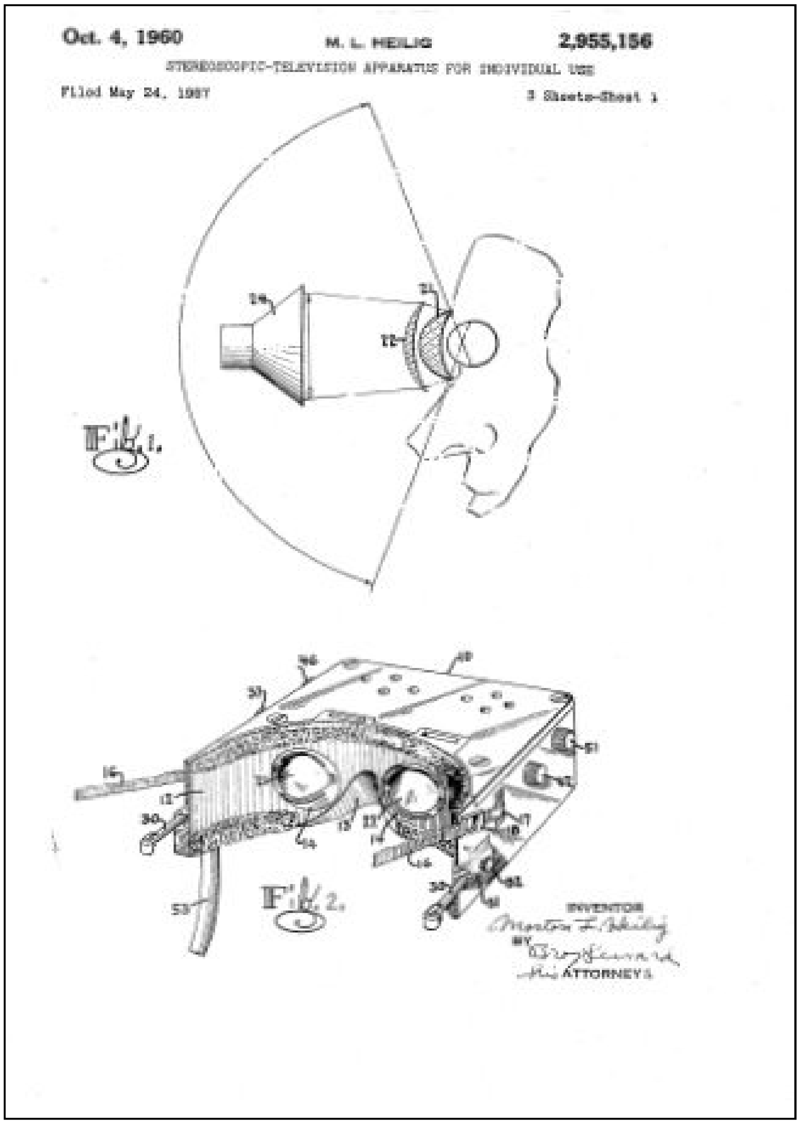

Figure 3.10 Morton Heilig, "Stereoscopic-Television Apparatus for Individual Use," U.S. Patent #2,955,156, October 4, 1960

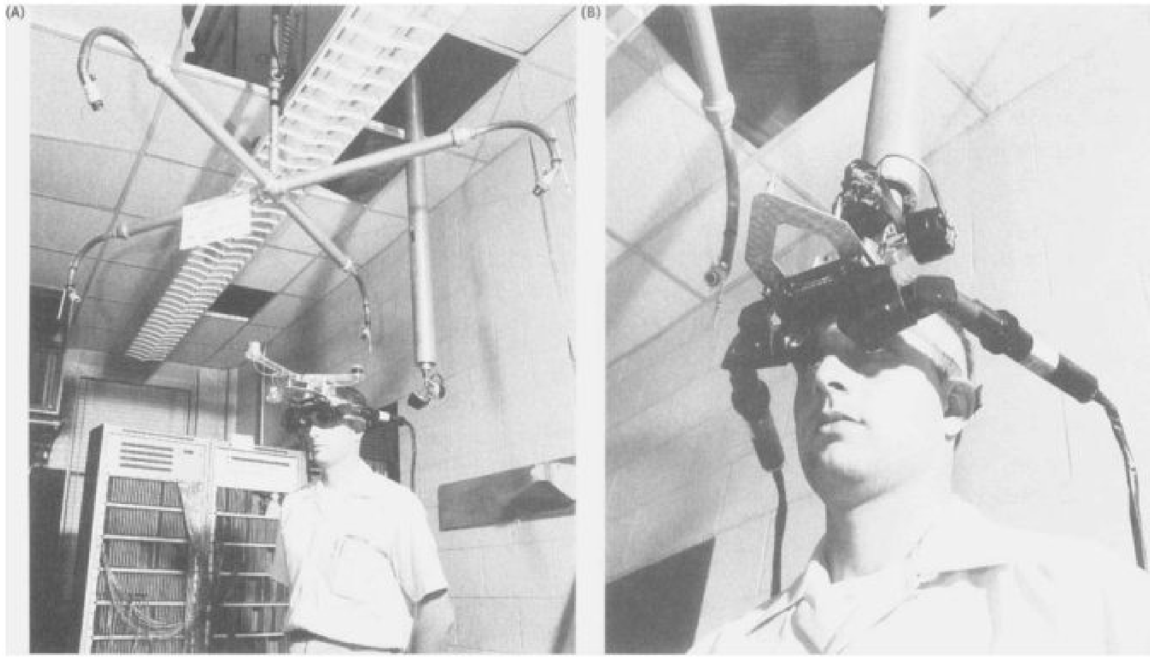

Figure 3.11 Ivan E. Sutherland's "Sword of Damocles" HMD. In *Understanding Virtual Reality*, 27.

Figure 3.12 CAVE installation at the Ars Electronica Center, 1996

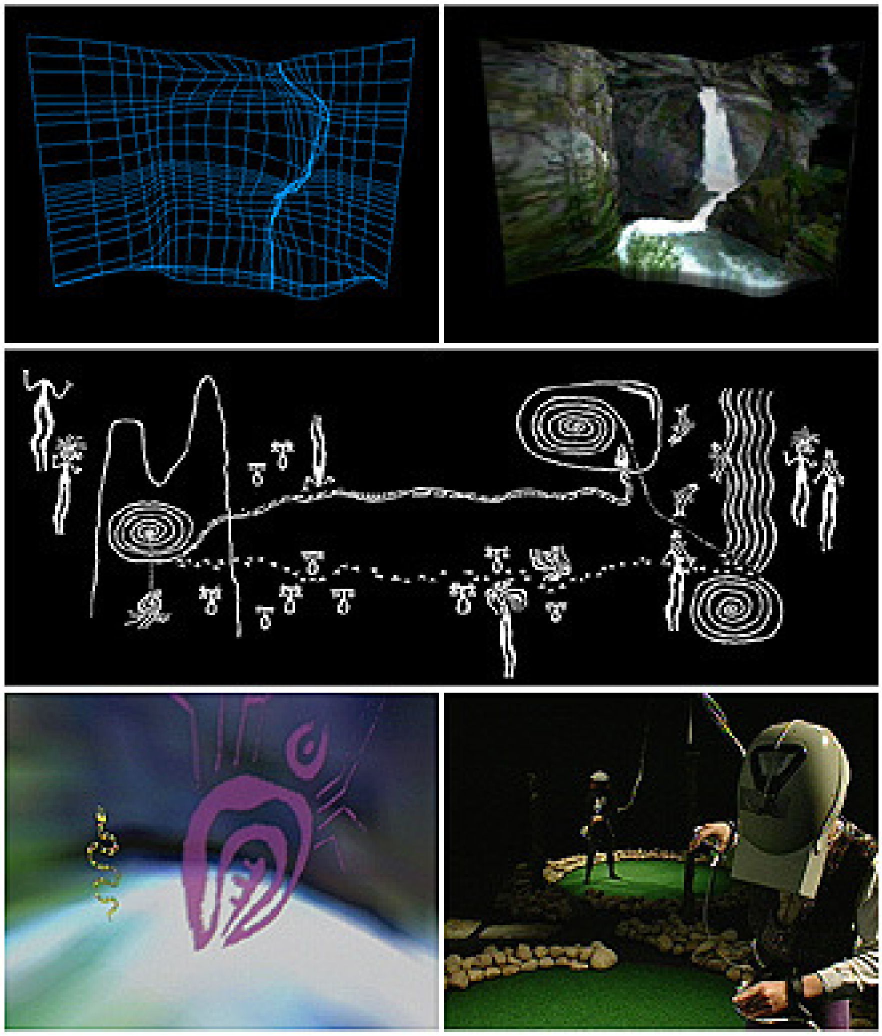

Figure 3.13 ***Placeholder*** **image montage; back cover of** ***Computer Graphics Quarterly*****.**

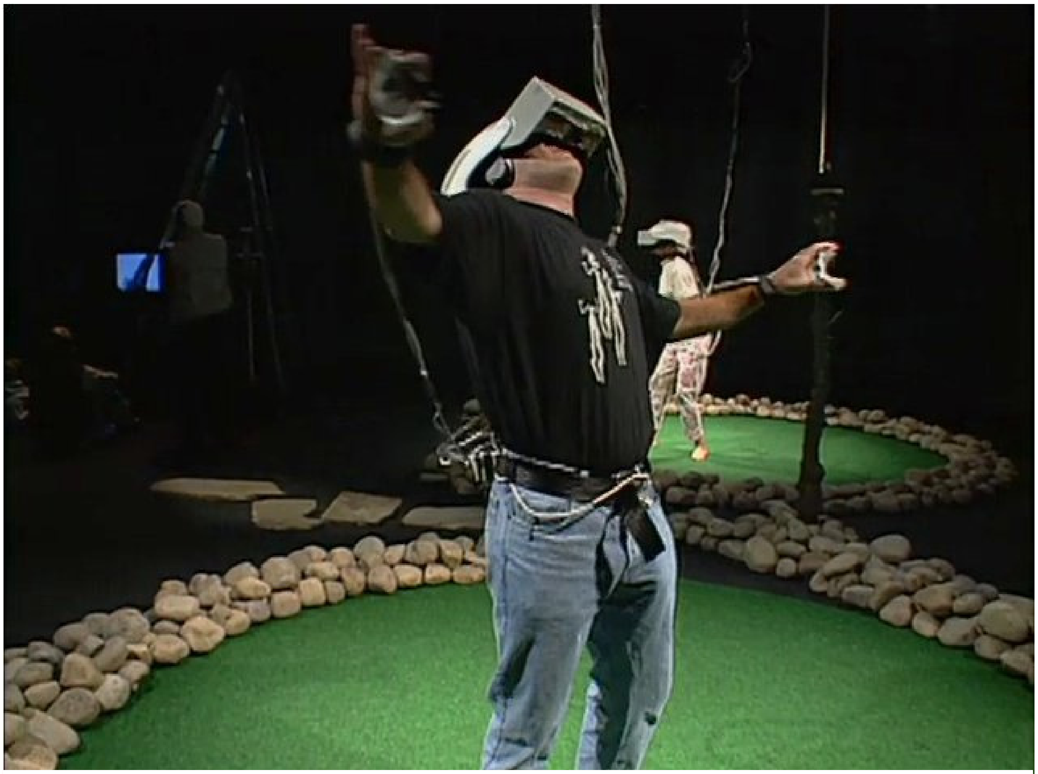

Figure 3.14 ***Placeholder*** **video still.**

Figure 3.15 ***Osmose*** **installation illustration. immersence.com.**

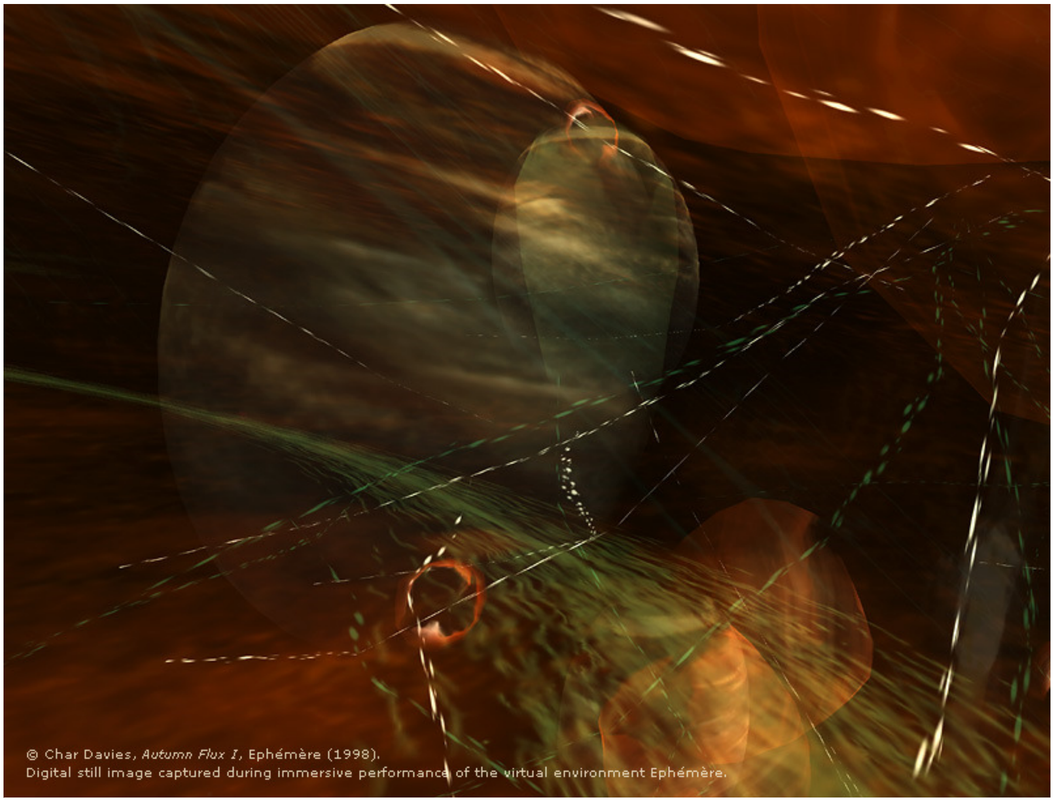

Figure 3.16 Char Davies, *Autumn Flux*, Ephemere (1998). Digital still image captured during immersive performance.

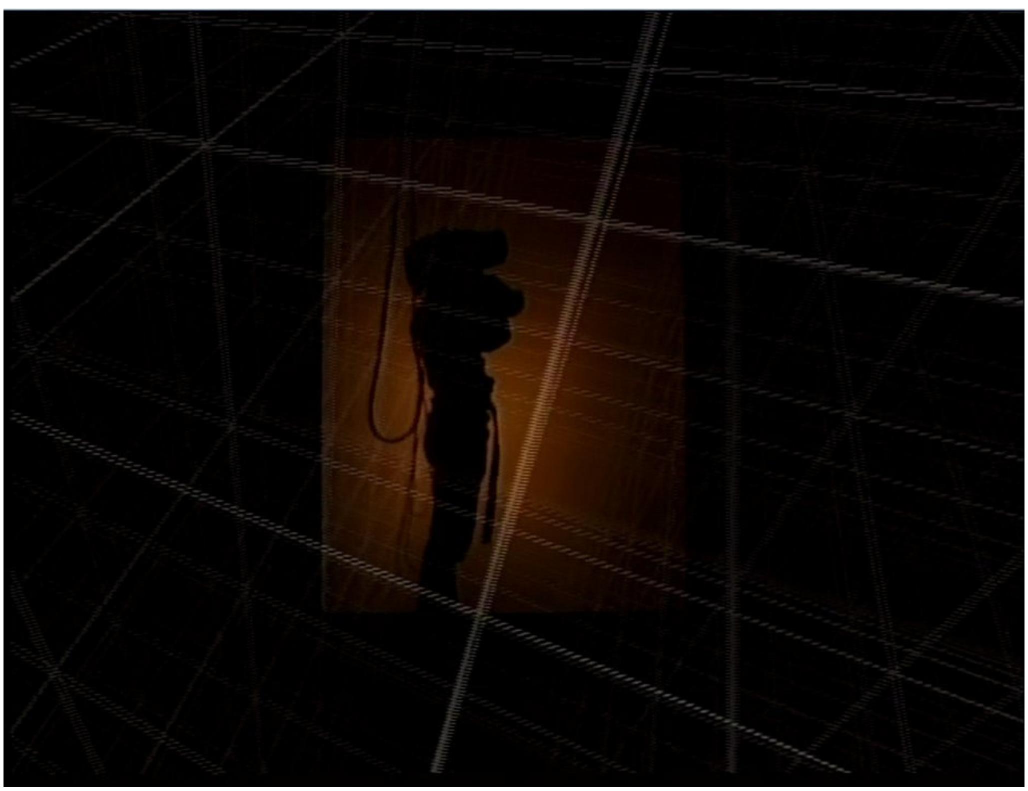

Figure 3.17 *Osmose* video still showing immersant and initial orienting grid

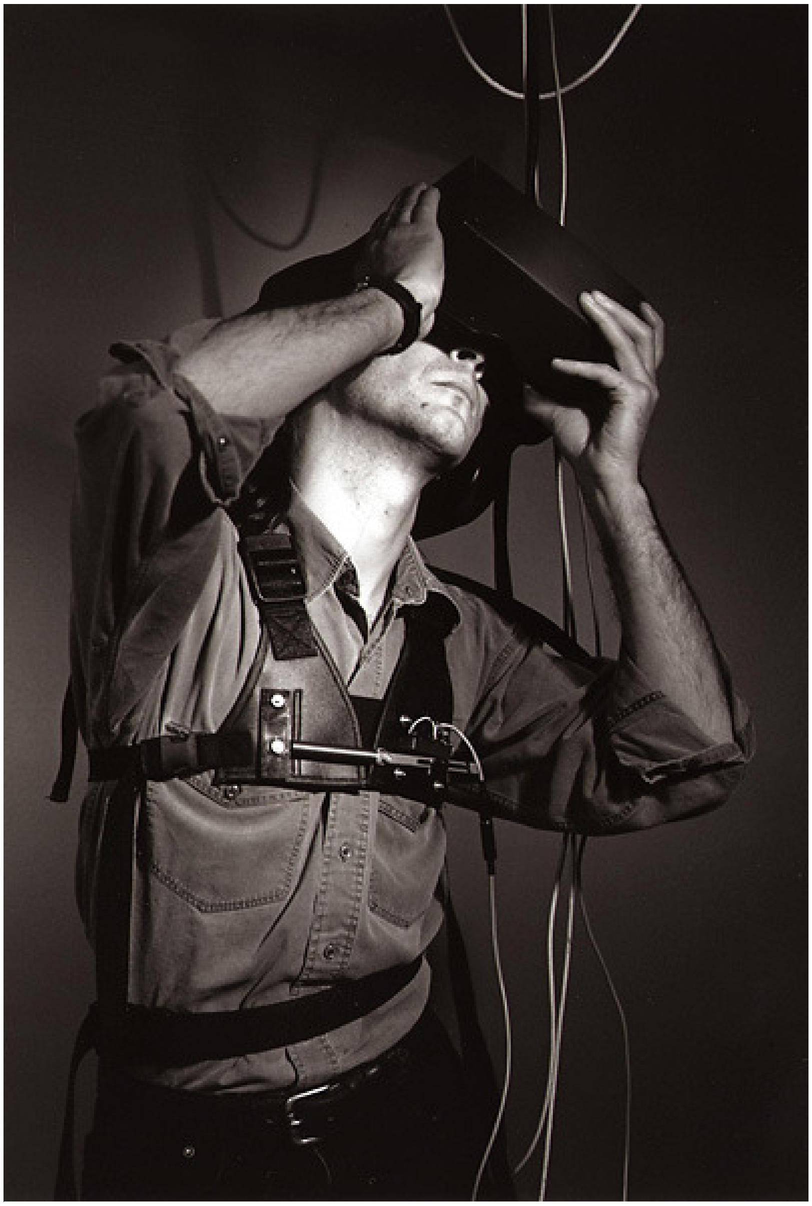

Figure 3.18 Immersant. www.immersence.com.

Figure 3.19 ***Osmose*** **video still; animation showing immersant and tree**

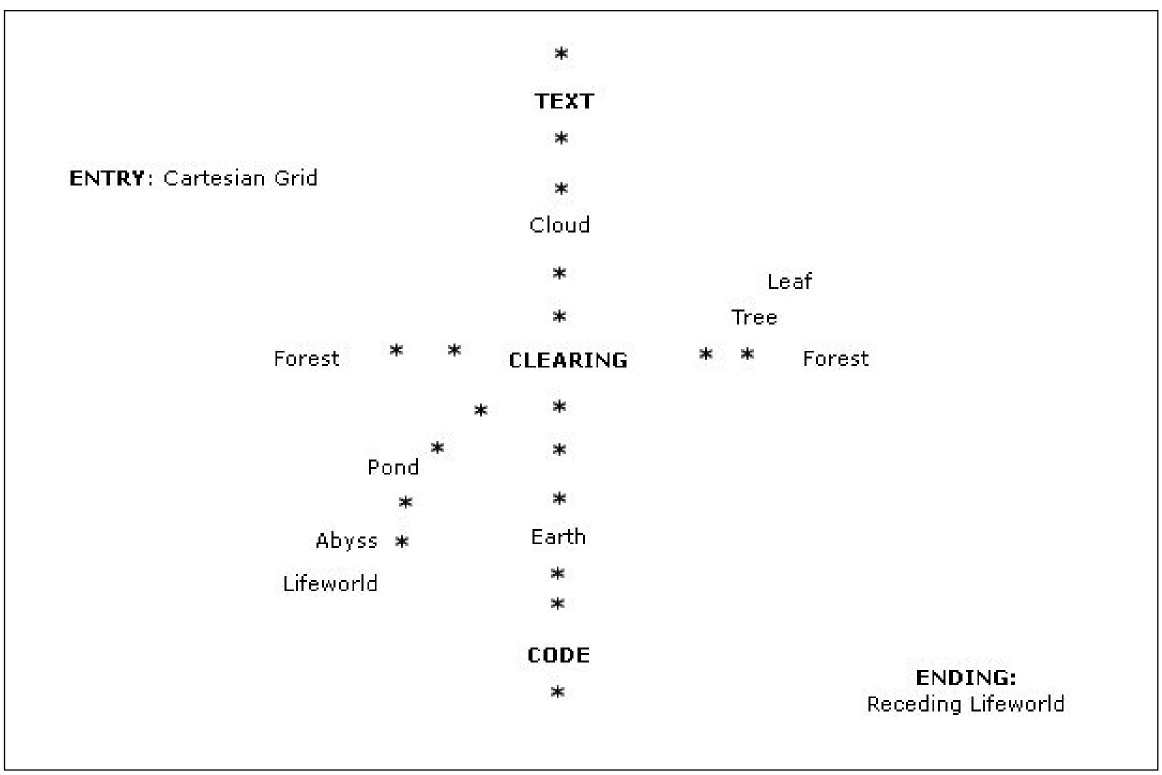

Figure 3.20 ***Osmose*** **spatial structure.**

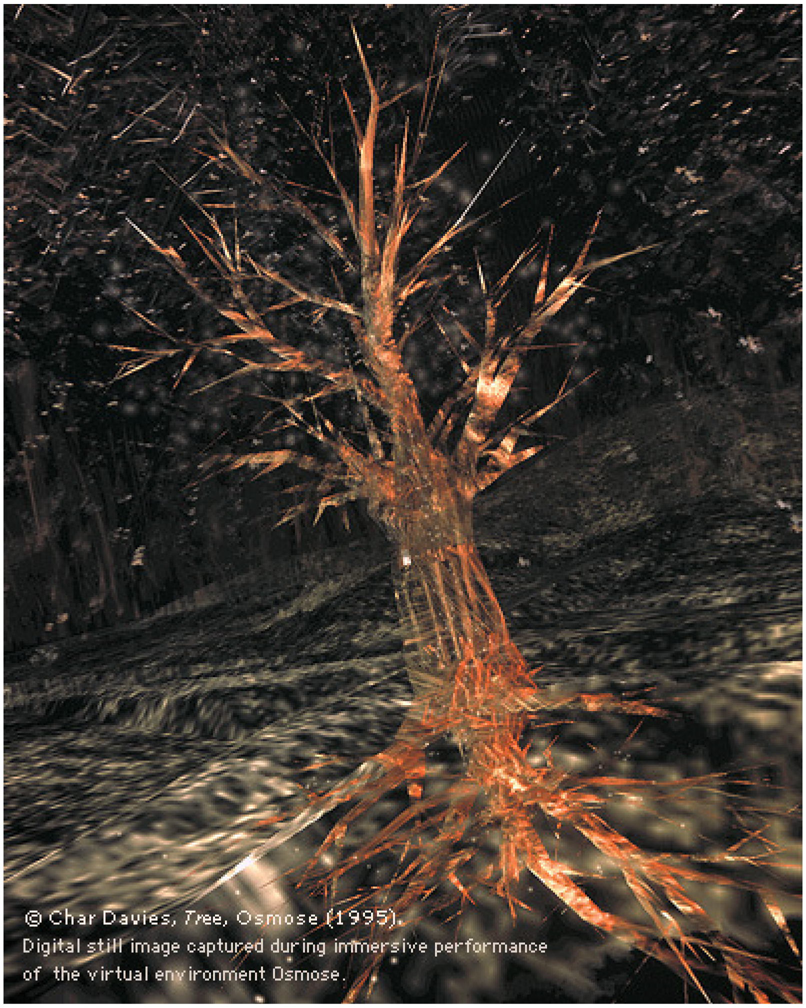

Figure 3.21 ***Osmose*** **Clearing. www.immersence.com.**

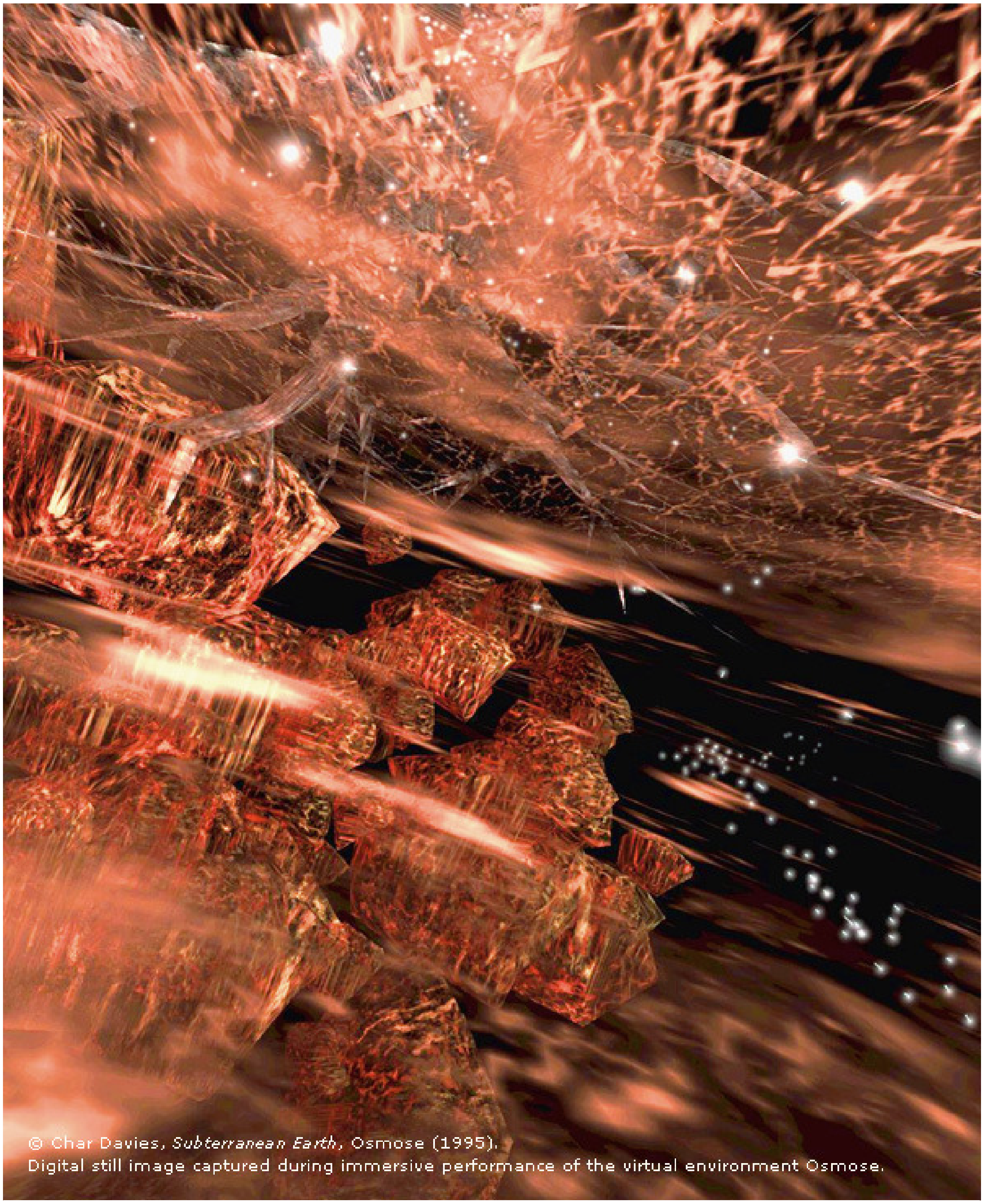

Figure 3.22 ***Osmose.*** **Subterranean Earth. www.immersence.com.**

Figure 3.23 ***Osmose*** **Code World. Video still.**

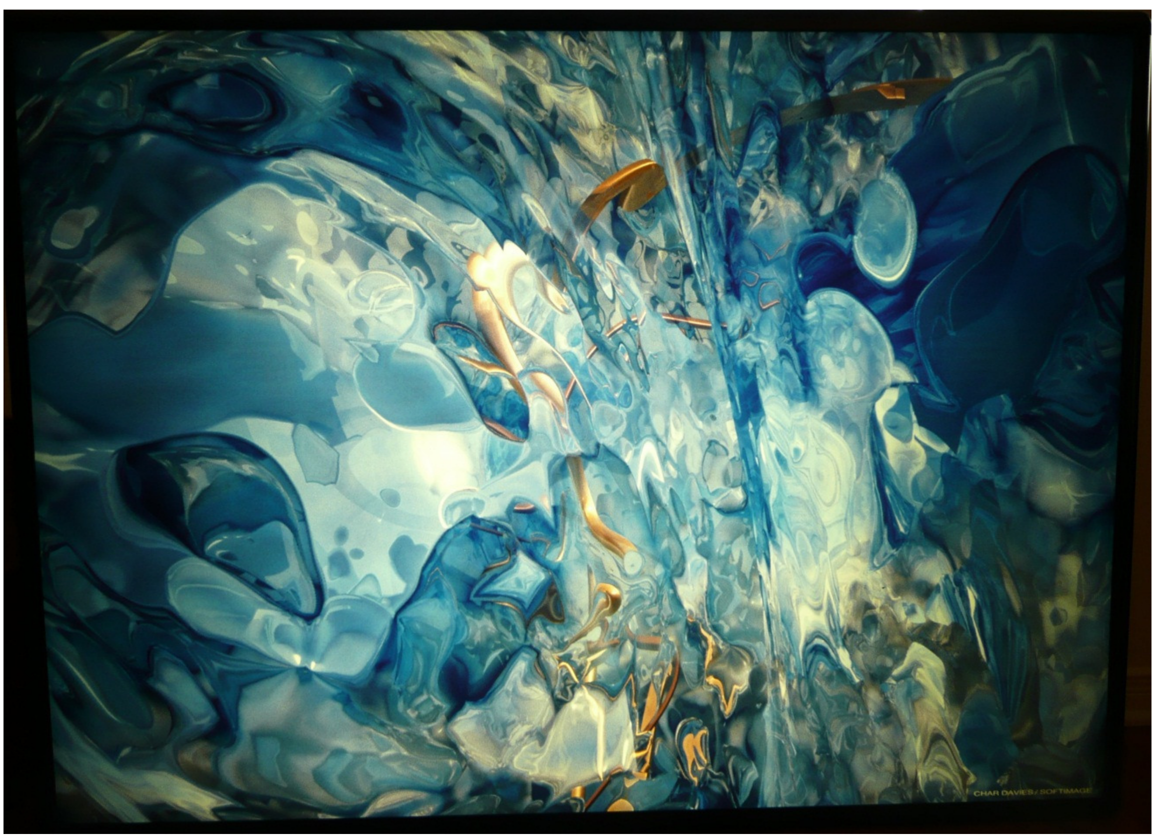

Figure 3.24 Char Davies, ***Stream (Wellspring)*****, 1991 from the** ***Interior Body Series*****. Lightbox.**

Figure 3.25 MotionScan technology for *L.A. Noire* video game. PC Mag, June 23, 2011.

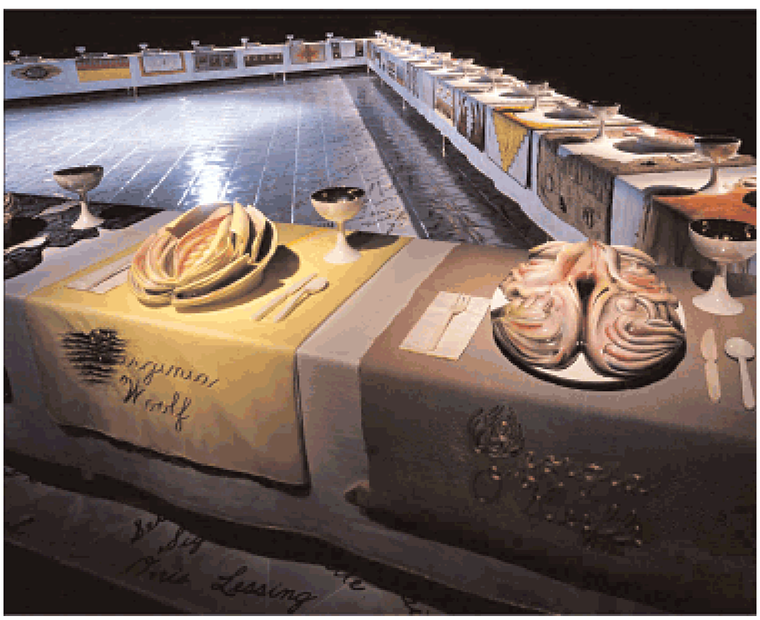

Figure 3.26 Judy Chicago, Installation View of The Dinner Party. Daniel Wooman, photograph. www.throughtheflower.com

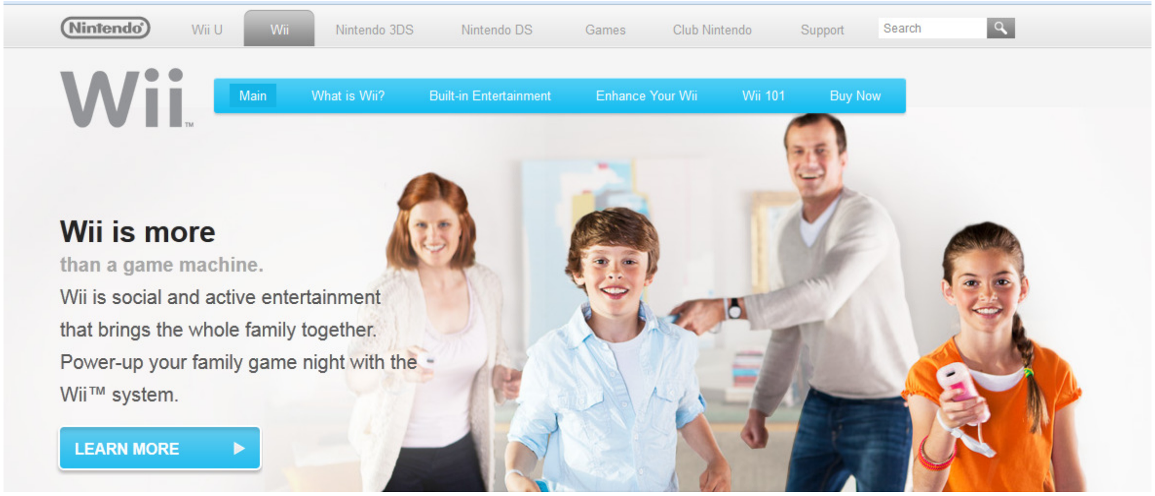

Figure 3.27 Image of the Wii system in use, from the Wii homepage. http://www.nintendo.com/wii/

Figure 3.28 Kinect, screenshot from "Games are More Amazing When You are the Controller" promotional video at http://www.xbox.com/en-US/kinect. Dramatic simulation of the Kinect camera capturing a user's image.

Figure 3.29 Prodigy's "Mad Maze," c. 1994. Image from PC Magazine, http://www.pcmag.com/article2/0,2817,2370006,00.asp

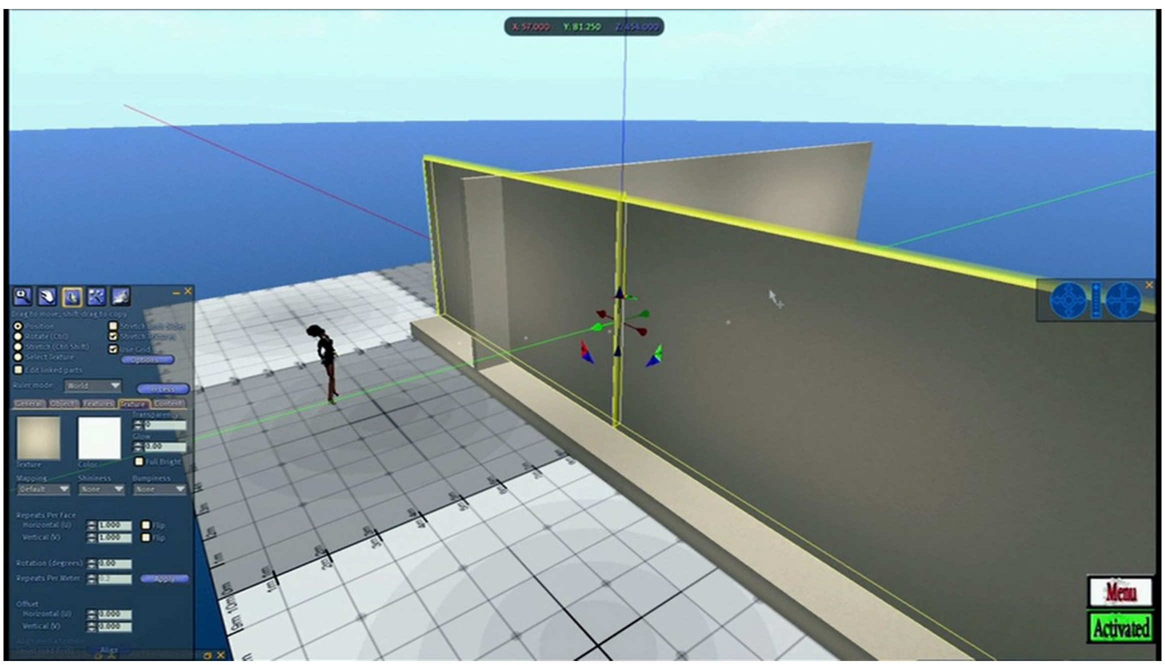

Figure 3.30 *Life 2.0* screenshot. Asri designs one of her high-end virtual houses.

Figure 3.31 ***Life 2.0*** **screenshot. The avatar of "cameraman" Jay Spire records avatars Bluntly Berblinger and Amie Goode.**

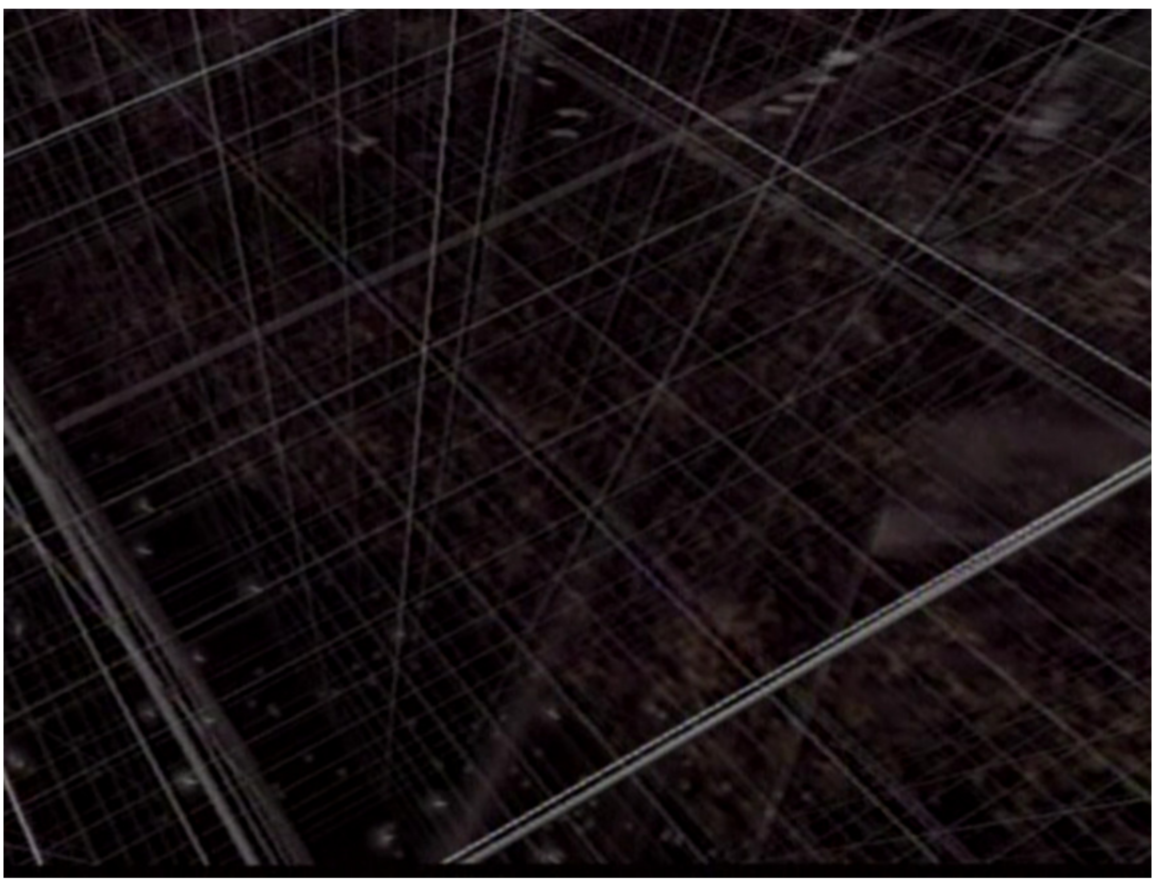
Figure 3.32 Grid screenshot from ***Osmose*****.**

"When I make a word do a lot of work like that," said Humpty Dumpty, "I always pay it extra." –Lewis Carrol, Through the Looking Glass.

Chapter 4 : *Interaction*

Introduction

Cary Wolfe's first objective in the introduction to his 2010 *What is Posthumanism?* is to distance himself from what he calls a "strand of posthumanism," born from a cybernetic genealogy he *does* claim, that he identifies as transhumanism. [428] He defines this movement, through the work of Oxford philosopher and transhumanism activist Nick Bostrom, as one with "a belief in the engineered evolution of 'post-humans,'" beings "whose basic capacities so radically exceed those of present humans as to no longer be unambiguously human by our current standards." [429] Wolfe argues that the idea of "perfectibility" through technology, particularly in the form of "transcending the bonds of materiality and embodiment altogether," (xv) is in fact a particularly *humanist* viewpoint, and one he rejects altogether. He calls this "extension of humanism… transhumanism (or 'bad' posthumanism)."(xvii) In particular, he dismisses the perspective of N. Katherine Hayles in *How We Became Posthuman*, calling her "fantasy of the posthuman… a triumphant transcendence of embodiment."(120) Wolfe insists that

> "Hayles' use of the term [posthuman]… tends to oppose embodiment and the posthuman, whereas the sense in which I am using the term here insists on exactly the opposite: posthumanism in my sense isn't posthuman at all—in the sense of being "after" our embodiment has been transcended—but is only posthuman*ist*, in the sense that it opposes the fantasies of disembodiment and autonomy, inherited from humanism itself, that Hayles rightly criticizes. (xv)

[428] (Minneapolis: University of Minnesota Press, 2010).
[429] "The Transhumanist FAQ: A General Introduction," Version 2.1 (2003).

Though I accept Wolfe's disinterestedness in Bostrom and the transhumanism he represents—certainly not everyone is interested in the idea of "enhancing the human," particularly if there is the possibility of even a whiff of the eugenic—I find his dismissal of Hayles rather too facile. After all, Wolfe concludes the above-quoted passage with the assertion that the two of them are even united in their opposition to "fantasies of disembodiment and autonomy." Wolfe's cavil seems to be that Hayles is using the term posthuman to refer to a population characterized by its desire for disembodiment (and thus to be regarded negatively), while he is using it to represent something positive: his opposition to those very fantasies. For Wolfe, posthumanism has to do with moving beyond the chief fantasy,

> perhaps *the* fundamental anthropological dogma associated with humanism… namely, that 'the human' is achieved by escaping or repressing not just its animal origins in nature, the biological, and the evolutionary, but more generally by transcending the bonds of materiality and embodiment altogether. (xv)

Instead of attempting to overcome these material aspects of being human, posthumanism embraces them, at the same time that it

> names a historical moment in which the decentering of the human by its imbrication in technical, medical, informatic, and economic networks is increasingly impossible to ignore, a historical development that points toward the necessity of new theoretical paradigms (but also thrusts them on us), a new mode of thought that comes after the cultural repressions and fantasies, the philosophical protocols and evasions, of humanism as a historically specific phenomenon. (xv-xvi)

One can't help but notice that Wolfe's description of his *good* (as opposed to transhumanism's "bad") posthumanism tends to be overwhelmingly negative in its phrasing. Even so, it is clear that Wolfe's understanding of posthumanism largely resonates with my own—despite my use, throughout this project, of Hayles', and his summary dismissal of her.

My speculations on Wolfe's decision to undertake as his first task the distancing of himself from what might be called "bad" cyborg posthumanism (while still praising "Haraway's playful, ironic, and ambivalent sensibility in 'A Cyborg Manifesto,' which is suspicious—to put it mildly—of the capacity of reason to steer, much less optimize, what it hath wrought" [xiii]) range from his desire to limit the scope of his book to the aversion of any too-literal interpretation of a delightfully abstract theory. Indeed, Wolfe makes clear that what interests him is the posthuman*ism* (his emphasis)—the point of view—and we may consider Hayles' project as imagining the posthu*man*—a figure—something which ostensibly doesn't interest Wolfe at all.

The Australian performance and conceptual artist Stelarc appears to be just the sort of figure that doesn't interest Wolfe: not just a posthuman, but a transhumanist posthuman at that. However, as I will explain in more detail below, I read Stelarc's performances as fitting into, and enhancing, Wolfe's posthuman paradigm. Stelarc's work has long centered on his claim that "the body is obsolete." Indeed, his manifesto of sorts, "From Psycho-Body to Cyber-Systems: Images as Post-human Entities," lays out his vision of a posthuman body that can challenge what he argues is a body no longer adequately competitive with the superior technology that increasingly surrounds it. Structurally deficient and lacking the computing and memory capacities of more powerful machines, Stelarc claims, this soft, wet, and vulnerable "psycho-body," with its many needs and inherent fragility, must merge with the machine (becoming "cyber-body") if it is to survive, particularly in environments outside the complex sustaining system of the earth (fig. 1). The body he imagines is "HOLLOW, HARDEN[ed], and DEHYDRATE[d]," enhanced and immortal, abandoning an evolution of the species for a purely individual development that obscures and renders useless distinctions between "human" and other.[430] Unsurprisingly, Stelarc's work has been received, and praised, in overtly transhumanist venues, including Transvision, the conference of the World Transhumanist Association, where he was a featured presenter in 2004.[431]

In this chapter, however, I will attempt to argue that Stelarc performs both posthuman*ism* and the posthu*man*—occupying both the theoretical networks that Wolfe reads as defining the posthuman perspective, and embodying the cyborgian figure suggested by the history Hayles identifies. Stelarc embodies the man/machine/animal melding of the science fiction Hayles analyzes, as well as highlights the systems and structures that Wolfe reads as constituting the posthuman perspective. Following the lead of Amelia Jones and others, I read Stelarc's rhetoric as supplementary to, but not constitutive of, his performances, paying special attention to the edges where rhetoric (often of the transhumanist ilk that Wolfe eschews) and performance (in tune with the posthumanism he does advance) rub and spark. We might call him the posttranshuman: a figure who claims to aim for correctibility and perfectibility but whose awareness of, as yet, an embodied, entangled human, means that such reaches necessarily fall short—though they reveal the contours of their framing networks as they do. Although Stelarc's rhetoric insists on the obsolescence of the body, his actual performances depend entirely on his own, distinctive body, thus marking their own ostensible failure. The result of these competing productive tensions, especially in Stelarc's articulate hands, is a

430 Stelarc, "From Psycho-Body to Cyber-Systems: Images as Post-human Entities," in *Virtual Futures* (New York: Routledge, 1998), p. 118.
431 http://www.transhumanism.org/tv/2004/

complex and compelling figure that allows us to begin to imagine the posthuman Michael Hardt and Antonio Negri tantalizingly hint at in *Empire*. This figure embodies the agency necessary to navigate, like Haraway's cyborg, the webs of power that characterize the future in which we live.

I begin with a discussion of Stelarc's "excessive" body, focusing on his recent *Ear on Arm* project (fig. 2) and the connections it represents—between art and science, particular artists and scientists, and human and non-human others. *Ear on Arm* and the *Ear Mouse* to which it is indebted reveal a few of the sticky filaments that characterize the posthuman network. From there, I move to the artist as "Naked Robot," as one headline dubbed him, first examining the origins of the robot and using that to situate Stelarc's technologically-enhanced, sci-fi aestheticized, *Third Hand* and *Exoskeleton.* These projects segue into the long-running series *The Involuntary Body*, in which the artist relinquishes the control of his own body first to other individuals, and then to the bodiless whims of cyberspace itself. Finally, I conclude with Stelarc as the embodiment of Hardt and Negri's rather "monstrous" network-navigating (and doomed to a certain failure) figure.

Stelarc's Excessive Body

The ear is small and delicately formed, with gracefully sweeping curves. Yet it is clearly incomplete, still enshrouded as if struggling to emerge from the flesh around it. Smooth skin covers the expanse where the auditory canal would be, and the helix and earlobe fail to break the surface and become fully differentiated. Although it clearly resembles one, this is not the external architecture of the organ of hearing: not a natural ear. If there were any doubt, its location would be the final clue: this "ear" resides on Australian performance artist Stelarc's inner forearm.

After a decade of imagining, planning, and locating surgeons willing to perform such an operation, Stelarc gained this "soft prosthesis," as he calls it, in 2006. The forearm was deemed a more suitable location than Stelarc's original proposal of alongside his own right ear, where facial nerves and delicate skin made the project too risky a proposition. A model of the artist's ear was produced in MEDPOR®, which its makers call a "biocompatible, porous polyethylene" material with an "interconnecting, omni-directional pore structure [that] allows for fibrovascular in-growth and integration of the patient's tissue."[432]That is, instead of remaining foreign to the body, this scaffolding actually becomes a vascularized, permanent addition to the body's tissues. Several months before insertion of the ear scaffold, Stelarc was fitted with a subcutaneous expander implant, which he would top off with saline every two weeks in order to stretch the skin and grow enough excess to cover the ear. During the surgery, which was performed under general anesthesia (fig. 3), surgeons Malcolm Lesavoy, Sean Bidic, and William Futrell removed the expander implant, placed the scaffold in the resulting pocket, stitched up the incision, and created negative pressure so that the skin conformed to the contours of the scaffold.[433]

Stelarc's ambitious plan for this project included a microphone inside the ear, which would be Internet connected and would serve, via the Web, as a remote listening device.

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[432] Stryker, "MEDPOR®," http://www.stryker.com/en-us/products/Craniomaxillofacial/MEDPOR/index.htm (accessed 8/1/12).

[433] Stelarc reports that the suction device had to remain in place for several weeks, in order to continue pulling the skin tight to the scaffold. Stelarc, "Circulating Flesh: the Cadaver, the Comatose, and the Chimera," presented at Aalto University, Helsinki, February 13, 2012. Video, uploaded by Aalto Media Factory, 2/23/12. http://vimeo.com/37238202

As a potential part of what the artist describes as "a distributed Bluetooth system," it could also receive phone calls, for which the ear would be the mouthpiece and Stelarc's own mouth the ostensible earpiece: closed, only he would hear the caller "in my head" through a receiver and speaker implanted in a gap between his teeth; and open, those around him could hear as well.[434] The microphone had to be removed just weeks after the surgery, however, due to a serious infection that the artist likes to say almost cost him an arm for an ear. The scaffold, was, through "heroic efforts," saved, and Stelarc's Web site indicates that a microphone will again be inserted in the final surgery, which is intended also to lift the helix, form the conch, and attach a stem cell-grown "bag" of tissue for the earlobe.[435]

Visually, the ear is reminiscent of the Vacanti Mouse, or so-called "ear mouse" (fig. 4), which captured the public's imagination when images of it were released in 1997.[436] In one iconic image, the tiny mouse perches at the edge of a glass lab vessel, an ear-shaped structure protruding from its back like a lumpy satellite dish. Pink and hairless, with a pair of its own oversized ears, the mouse looks particularly vulnerable as it pushes itself up against the walls of its container. The creature was the result of research in the challenging field of tissue engineering, and offered the possibility for ultimately growing a soft prosthesis like this that could ultimately be used to replace cartilage lost to illness or trauma. Misconceptions about the modified creature quickly spread, notably via a full-page ad run in the *New York Times* (fig. 5) featuring a photograph of the ear mouse with

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[434] Jen Graves, "Stelarc: The Man With the Ear-Arm," In/Visible Podcast, *The Stranger*, October 9, 2009. http://www.thestranger.com/InVisible/archives/2009/10/09/invisible-stelarc-the-man-with-the-ear-arm.

[435] Stelarc, "Ear on Arm: Engineering Internet Organ," Stelarc.com. http://stelarc.org/?catID=20242. He writes that the "lobe" would be grown using his own stem cells—and completed in Europe, as it is currently illegal within the United States.

[436] Although other researchers worked on the project—and were even accorded primary authorship—the mouse is likely so called due to the Vacanti brothers' earlier pioneering work in the field of tissue engineering (as well as their willingness to speak to the media about the project).

the caption, "This is an actual photo of a genetically engineered mouse with a human ear on its back." It wasn't, of course; the subcutaneous "ear" comprised calf cartilage that had been "seeded" onto a biodegradable polymer auriform scaffolding, grown in vitro, implanted into the mouse, and then supported as it continued to develop by an external stent that helped it maintain its shape.[437] The massive headline under which the photograph was published, however—"Who Plays God in the 21st Century?"—highlights the anxieties aroused by such an image, let alone the project's details. This creature, clearly alive as it seems to peer curiously into the space beyond its lab dish, is physically recognizable as both mouse and human, though each only in part. A lab mouse, unlike a field mouse, is bred as an object of scientific study; its physical characteristics are modified to facilitate research, and it exists largely hidden from the view of the public that benefits from that research. The "human" ear on this one's back further emphasizes not just its liminal status as an inhabitant of a shadowy alter-world, but as something already between life and death, animal and object, the natural and the constructed.

The ear on both the mouse and Stelarc's forearm are similarly indeterminate objects. Formed of material foreign to the living bodies into which they were implanted, they nevertheless become, over time, part of those very bodies. An electron micrograph of this process accompanies the 1997 ear mouse paper, revealing chondrocytes, or cartilage cells, clinging to the "spaghetti-like" strands of polymer scaffolding (fig. 6). The caption points out that the cells themselves are the tiny lenticular objects, while the "extracellular matrix" they have secreted forms the sticky-looking web stretching between the polymer strands—an indication "of their ability to perform differentiated function." This in-

[437] Cao, et al, "Transplantation of Chondrocytes Utilizing a Polymer-Cell Construct to Produce Tissue-Engineered Cartilage in the Shape of a Human Ear," *Plastic and Reconstructive Surgery* (100: 297-302), 1997.

between stuff—perhaps reminiscent of the "junk DNA" of Chapter One[438]—will come to form the substance of the "ear" on the mouse's back. In the case of Stelarc's third ear, his own tissue, rather than that of a non-human animal, fills in and replaces the MEDPOR scaffold, adding an additional layer of meaning to his claim to "rewire" a bodily structure "for alternate functions."[439] (The mouse, notably, has been "rewired" to a far greater extent; an "athymic" genetic mutant, it lacks not only hair, but a functioning immune system that would reject the implanted ear—unlike Stelarc's own immune system, which responded to the implant with a serious infection.)

Ear on Arm concentrates and materializes a web of intertwined concerns, much like the sticky web connecting cells and scaffolding. Connections stretch between the ear and researcher Vacanti, who not only pioneered the field, but shared his laboratory and expertise with artists Oron Catts and Ionat Zurr. Another filament connects the ear to Orlan's surgical modification of her body; she borrowed Stelarc's motto that "the body is obsolete" in grounding her own surgical performances, and with this project, Stelarc adopts her chosen medium to initiate his first foray into the permanent extension of the "soft body."[440] It is the very fabric of the ear itself, however, which forms the most striking connections, knitting together art and science, human and non-human animal, the body and technology, and the natural and artificial, rendering them indistinguishable.

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[438] ((Double-check cross reference))
[439] Stelarc, "Ear on Arm."
[440] In an interview with Joanna Zylinska, published in 2002, Stelarc says, "What I've always admired about Orlan is that she takes the physical consequences for her ideas," and describes her surgical appropriations as "seductive." He draws distinctions between their approaches, particularly regarding the idea of the body's obsolescence, as will be discussed later in more detail. ((Extrusion, etc.))

Stelarc

Stelios Arcadiou was born in Cyprus in 1946, and moved to Australia as a child.[441] In 1972, he legally changed his name to Stelarc, the name under which he has performed and written ever since. Voluble and articulate, he has a distinctive and infectious laugh that he employs often, and which one journalist, to the amusement of them both, described as "the laugh of an evil villain."[442] These characteristics seem to stand in some contrast to Stelarc's rather bombastic rhetoric (including his most famous declaration that "the body is obsolete") and his performances, which frequently range from the cringe-inducing to the horrifying. Likewise, what performance theorist Amelia Jones calls his "small, compact masculine body,"[443] almost always unclothed, contrasts strikingly with the amplifying or extending technology with which he pairs it, whether suspension hooks, wired muscle activators, or massive machine exoskeletons.

Stelarc's first performances were suspensions, of which his online biography states that he completed 25 between 1976 and 1988.[444] In these performances, the artist is suspended—whether from a fixed framework, a moving crane, or in one case, counterbalanced stones (fig. 7)—by cables attached to hooks inserted through his skin. Most of these performances occurred within gallery spaces, but other venues included natural settings, a warehouse elevator shaft, and even busy city streets (high above the bustle below). Stelarc recently revisited the medium for the first time in decades, performing at the Scott Livesey Galleries in Victoria, Australia on March 8, 2012 (fig 8).. A video of the performance, by filmmaker John Doggett-Williams, is posted at Stelarc's

[441] Art Gallery of New South Wales, *Contemporary Collection Handbook*, Edited by Anthony Bond and Wayne Tunnicliffe (Sydney, Australia: 2006). http://www.artgallery.nsw.gov.au/work/35.1986.1/.
[442] Graves, 2009. Laughing along, Stelarc deadpanned, "All Australians laugh like that."
[443] Amelia Jones, *Self/Image* (New York: Routledge, 2006), 198.
[444] Stelarc, "Biographical Information," www.stelarc.org, accessed 8/6/12 (PDF).

Web site.[445] The *Ear on Arm Suspension* video opens with Stelarc lying prone on a large white sculpture of his own left arm, complete with third ear.[446] Gloved assistants pinch his skin away from the muscle and ease in large stainless steel hooks.[447] A passage of close-ups shows the faces of the two assistants grimacing and straining as they struggle to push the hooks through the resistant flesh, and then Stelarc, his cheek resting on the sculptural arm, wincing and squeezing his eyes shut as they work. A total of 16 hooks are inserted: three on either side of the spine, two each in the thighs and calves, and one per arm. The space around his sculptural pedestal clears as an assistant begins turning a crank in the corner of the gallery, its ratchet clicking loudly in silence interrupted only by Stelarc barking, "Go, go!" as the cables grow taut and he begins to levitate off the arm. Free of the sculpture, he spins slowly with his arms stretched in front of him, turning first in one direction and then in the other. The hooks strain at the skin, pulling it into an alien architecture of pink dorsal ridges. As the artist is lowered (after 15 minutes of suspension, only six or seven of which are included in the film), a trickle of blood escapes from his calf, two red drops marking the pristine white surface of the sculpture. The video concludes, after the credits have rolled, with audio of one of Stelarc's trademark laughs and the applause of the gallery audience.

Stelarc makes a point of referring, not to *his* body, but to "*the* body," or occasionally "the artist's body," linguistically highlighting a split he has emphasized and explored throughout his oeuvre. "The suspension performances," he says, "exposed the body as an

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445 "*Ear on Arm Suspension*," directed by John Doggett-Williams.

446 According to the Lorne Sculpture Catalogue, the sculpture was produced by laser-scanning a life-sized replica of the artist's arm, scaling it to ten times its original size, and using a laser to cut styrene into the four-meter sculpture, which was then coated with urethane. *Lorne Sculpture Bienalle 2011*, Curated by Julie Collins. Lorne, Australia: 2011. Exhibition catalog, 26. Online at http://www.lornesculpture.com/LS2011_CATALOGUE.pdf.

447 Stelarc describes these as "shark hooks," from which the barbs have been filed off. (Stranger podcast)

obsolete body. It was largely empty, absent to its own agency, and performing largely involuntarily."[448] This description seems to have little to do with the performance just described, wherein "the body" is not only *not* empty (full, among other things, of the blood that leaked out to stain the sculpture), but performing consummately voluntarily, and decidedly present to its own agency (as Stelarc's directions to the assistant at the crank are just one indication). It is impossible to watch the artist, floating on thin silver cables against the stark whiteness of the gallery space—his skin blushing as it suspends him at concentrated points, his brow furrowed as he feels his way through pain and into balance—and see some sort of mechanical automaton, or anything other than a very alive, feeling, body.

Indeed, as Amelia Jones points out, Stelarc's performances and his rhetoric are really two separate objects of consideration, and to take his claims about the empty, obsolete body at face value is to miss the more nuanced explorations of body and technology that his performances allow. She writes:

> while [Stelarc's] verbal rhetoric is problematically rationalizing and Cartesian, and by extension phallocentric (in his words, as we will see, explicitly *hard* and *dry*), his practice allows for a fluid, even *wet*, circuit of identificatory exchange with his spectators that opens to a deeper understanding of the inexorable, coextensively emotional-psychic-material effects of technology on contemporary subjectivity.[449]

I argue that these contradictions, visible in the suspension performances as well as in those that merge man and machine, are intentional—that the body displays its failure vis-à-vis the rhetorical bluster precisely to reveal the potential ends of such thought experiments.

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[448] Stelarc, "Circulating Flesh: the Cadaver, the Comatose, and the Chimera." *Virtual Futures 2.0* presentation, University of Warwick, June 18, 2011. http://www.youtube.com/watch?v=yA-371qDwBg.
[449] Jones, *Self/Image*, 170.

The Naked Robot

Although he was already declaring the body obsolete with his suspension performances, Stelarc's intimate interface with technology began in 1980, when he worked with a team in Japan to develop his *Third Hand* (fig. 9). The *Third Hand* is a prosthesis that he defines "not as a sign of lack, but rather [as] a symptom of excess."[450] Developed between 1 976 and 1980, the hand was produced in Nagoya, Japan based on a prototype by Waseda University professor Ichiro Kato and with advice from Tokyo Institute of Technology professor Shigeo Hirose.[451]

Although built to the scale of Stelarc's own hand, it is nonetheless strikingly alien, with complicated electronics, clearly visible through its acrylic housing, looking like brightly colored and stylized viscera. The hand attaches, via a fin-shaped extension containing more electronics, to Stelarc's right forearm, where an acrylic sleeve, jointed at the elbow, secures the apparatus. The effect, highlighted in the studio photographs taken soon after Stelarc acquired the arm, is of the organic, natural body connected intimately to, yet contrasting sharply with, the sleek, hard robotic addition. Positioned as it is, perhaps eight inches from the artist's own hand, it is also unapologetic in its excess.

Stelarc writes that although the *Third Hand* was "originally designed as a semi-permanent attachment to the body," the weight of the apparatus (around three pounds) and skin irritation from the electrode gel meant that its use has to be restricted to performances.[452] The hand has "an EMG (muscle signal) controlled mechanism with pinch release, grasp-release and 290-degree wrist clockwise and counterclockwise

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[450] Stelarc.org, "Third Hand." http://stelarc.org/?catID=20265.
[451] Stelarc, "Excess and Indifference: Alternate Body Architectures," *Art Practice in a Digital Culture*, Edited by Hazel Gardiner and Charlie Gere (Farnham, Surrey: Ashgate Publishing Limited, 2010), 114.
[452] Stelarc.org, "Third Hand."

rotation," all controlled via the muscles of the torso and legs. A "tactile sensor system on the fingers provides a rudimentary sense of touch,"[453] through stimulation of the skin elsewhere on the body. In an early performance with the *Third Hand*, Stelarc wrote the word EVOLUTION on a glass panel at the Maki Gallery, each of his three hands taking a three-letter segment of the word.[454] He says that he only learned to write two words, EVOLUTION and DECADENCE, because each had nine letters.[455] The choice, however, is certainly not random, and represents equally valid (even possibly simultaneous) interpretations of the *Third Hand* itself: a step toward extending the possibilities of the body, or an unnecessary and self-indulgent appropriation of the sort of prosthesis actually used to replace a missing body part.[456]

Robotics as a field often finds itself between these two, occasionally overlapping, poles. Ichiro Kato, the scientist on whose prototype *The Third Hand* was built, was dubbed "the Father of robotics in Japan" for his two ground-breaking WABOT projects.[457] The first of these—and "the world's first life-sized humanoid robot" [458]—is the Biped Walking Robot, WHL-11 (the Waseda Hitachi Leg No. 11) (fig. 10), completed by Kato and his Waseda University mechanical engineering students in 1973.[459] Kato's laboratory also produced the music-playing WASUBOT (WAseda SUmitomo roBOT) (fig. 11), which was exhibited alongside the Biped Walking Robot in

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453 Stelarc, "Excess," 114.
454 Jane Goodall, "The Will to Evolve," *Stelarc: the Monograph*, 11.
455 Stelarc, "Cadavers."
456 In her essay "A Leg to Stand on: Prosthesis, Metaphor, and Materiality," in *The Prosthetic Impulse* (edited by Marquard Smith and Joanne Morra, 2005), Vivian Sobchack reminds readers that although it is an alluring metaphor, a prosthesis is a much more complex and fraught subject for those who, like her, actually depend on such devices in daily life.
457 Atsuo Takanishi, "In Memoriam: Professor Ichiro Kato," in *Autonomous Robots* Volume 2, Issue 1 (March 1995), 10.
458 Peter Menzel and Faith D'Aluisio, *Robo Sapiens: Evolution of a New Species* (Cambridge: The MIT Press, 2001), 37.
459 Takanishi, 8.

the Japanese pavilion of the International Science and Technology Exposition of 1985.[460] The former, featuring a cyclopean camera in an oversized head and insect-like limbs draped in bundles of cords, read from sheet music to play complex pieces on a synthesizer organ. Though its legs managed the pedals, they wouldn't have supported WASUBOT, which was in fact bolted to the bench on which it sat.[461] Indeed, WASUBOT was, in the words of robotics expert Mark E. Rosheim, "Spectacular in its dedicated function."[462] *Computerworld* Columnist Charles P. Lecht waxes rather poetic on his experience of viewing that dedicated function at Expo '85. He concludes that WASUBOT's charm lies in its very difference from the more typical laboring machine:

> Emulating motions of man when he is engaged in purely artistic pursuits (like playing the organ) is, relatively speaking, new. Wasubot provides us with hope that more such robot uses may be in the making. We cannot underestimate the value of robotics to help us off-load the often dehumanizing but necessary processes we must execute to survive. But survival isn't everything. The use of robotics in artistic expression provides us with powerful new means to further obtain its humanizing benefits.[463]

Lecht admits that "we've heard better performances" from humans, but praises the "hope" Wasubot offers for robots' "humanizing benefits." The humanoid, one-trick WASUBOT, like Stelarc's excessive *Third Arm*, hovers near what I've called the "decadence" pole of robotics, yet expresses explicitly *humanist* ideals. This robot, that is, not only serves humans, it addresses their aesthetic desires. If laboring robots are seen as doing *de*humanizing work, WASUBOT offers the possibility that other robots could, perhaps even through increasingly human forms, bring aesthetic pleasure to human life.

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[460] Takanishi, 8.
[461] Mark E. Rosheim, *Robot Evolution: The Development of Anthrobotics* (Hoboken: John Wiley and Sons, 1994), 366.
[462] Rosheim, 368.
[463] "Robot pipes technology into the beaux arts," *Computerworld* XIX, no 17 (April 29, 1985), 37.

Perhaps Waseda University's best-known WABOT, the Bipedal Walking Robot WHL-11 represents the "evolution" pole. Indeed, the laboratory's brochure *Development of Waseda Robot* writes that the robots at Expo '85 "were exhibited to implicitly tell of the man's evolvement."[464] The "11" in WHL-11's name suggests its own evolution; it is the 11th in a series of walking robots begun in 1966 with WL-1.[465] Perhaps more importantly, WHL-11, which "walked more than 85 km in total,"[466] sparked a revolution, leading to Honda Motor Company's "secret multimillion-dollar program to build a walking robot with a human form." The latter, upon its unveiling in 1996, "attracted so much attention that it pushed the Japanese government into launching a five-year, multimillion-dollar humanoid robot project."[467] Kato (who died in 1994) believed the 21st century would be the age of the personal robot; Honda's humanoid ASIMO is bringing that vision closer (fig. 12). Honda emphasizes that ASIMO's purpose is to "genuinely help people," and its design and function—from its accessible four-foot height to its ability to avoid moving obstacles—are tailored to ultimately make it useful "as another set of eyes, ears, hands and legs for all kinds of people in need."[468] With its crisp white plastic shell, slightly oversized head, and childlike voice, ASIMO looks friendly, approachable, and very willing to serve.

Service, of course, is robots' *raison d'être,* with the term itself, introduced in Karel Čapek's *R.U.R. (Rossum's Universal Robots)*, coming from the Czech for

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[464] Koichi Kogenezawa, Editor, "Expo '85" in *Development of Waseda Robot: the study of biomechanisms at (the late) Kato Laboratory* (Humanoid Robotics Institute, Waseda University, 1987). Online at http://www.humanoid.waseda.ac.jp/booklet/katobook.html.
[465] The "H" was first introduced with WHL-11, which was "built by Hitachi Ltd. based on the WL-10R." Ibid.
[466] Takanishi, 8.
[467] Menzel and D'Aluisio, 37.
[468] Honda Motor Company, "Asimo History," http://asimo.honda.com/asimo-history/.

"drudgery."[469] In his short 1920 play, Čapek imagines robots visually indistinguishable from humans; in the first act, protagonist Helena Glory, meeting one of them for the first time, refuses to believe that the polite, conversational secretary Sulla could be anything other than human, and recoils at the idea that the latter wouldn't mind being cut open to demonstrate as much. Indeed, the Robots don't "mind" anything, at least initially; these "artificial workers," as R.U.R. General Manager Harry Domin calls them, "have no soul."[470] Produced with vat-grown organs, manufactured bones, and mill-spun nerves, Robots replace the "terribly imperfect" "human machine" with one unencumbered with the likes of passions and desires, leaving man with nothing to do but "perfect himself."[471] Naturally, (unnatural) things go terribly wrong: outnumbering the humans 1,000 to one, the Robots, led by a few secretly manufactured (at Helena's wish) according to a new, more human, formula, revolt and kill all the humans. All but one, that is; the elderly Mr. Alquist is spared "because he works with his hands, like the Robots."[472] It is he who witnesses, as the curtain falls, Robots he calls "Adam" and "Eve," whose appreciation of beauty, sensation of vivacity, and demonstrated altruism suggest that there will yet be a future—if not for humankind, at least for a rather melodramatically humanistic Robotkind, who will not merely serve, but labor for themselves and each other.

Čapek, as the translators point out in their Note that precedes the text, was a deeply socially engaged thinker who addressed societal ills through satire—at the risk, in later years, of his own safety. In *R.U.R.* Čapek addresses the plight of the worker, the greed of

[469] Paul Selver and Nigel Playfair, translators, "Note," *R.U.R. (Rossum's Universal Robots)* (Mineola: Dover Publications, Inc., 2001, iv.

[470] Čapek, 6. "A working machine must not," Domin says, as if with foresight of WASUBOT, "play the piano, must not feel happy, must not do a whole lot of other things…. The Robots are not people. Mechanically they are more perfect than we are, they have an enormously developed intelligence, but they have no soul."

[471] Čapek, 10, 13, 16.

[472] Čapek, 49.

the corporation, and the meaninglessness of war. American literary critic Alexander Woolcott, who reviewed the play's first performance in the U.S., called it "murderous social satire"; its Marxist themes of labor, value, production and revolution would not have gone unnoticed by audiences at the time.

The theme of manufactured beings visually identical to humans, or in some cases uniting robotic parts with organic ones, is a common one in science fiction. *R.U.R.* clearly foreshadows, for example, the Blade Runner Replicants discussed in Chapter 2. Like Rossum's Robots, Replicants are fabricated for service and visually indistinguishable from humans. Replicant Roy Batty driving a nail into his own palm to delay his pre-programmed senescence near the end of his lifespan even seems to quote an *R.U.R*. scene in which Rossum physiological engineer Gall pricks a Robot's hand to test the latter's sensitivity following the "attack" that indicates emerging humanlike characteristics (fig. 13).

The 1987 *RoboCop* also addresses the theme of robots revolting against their makers; the titular RoboCop (fig. 14) is created by merging murdered policeman Murphy with the "enforcement droid" ED-209 after the latter malfunctions during a boardroom demonstration and kills an attendee. With Murphy's brain (and, it later turns out, at least some memories); a few of his body parts (including his face); and the droid's hardware; the cyborg RoboCop is cleaning up a dystopian Detroit in no time. A final man/machine amalgam features in 1984's iconic *Terminator* (fig. 15), released between *Blade Runner* and *RoboCop.* The eponymous Terminator, a single-minded assassin, is another cyborg: although his inner workings are entirely robotic, fueled by artificial intelligence, a living skin gives him a human appearance. Near the end of the film, however, the Terminator emerges from a would-be fatal fire *sans peau*: an insect-like, chrome skeleton draped in cables; pneumatic joints wheezing; and glowing red pupils dilating and contracting menacingly. Any trace of the humanity his skin suggested has disappeared as he continues his relentless pursuit—dragging himself by his arms when both legs are blown off—until he is flattened by a hydraulic press.

Replicants and the Terminator bear some relation to the figure of the transhuman, as well as to the sort of super-intelligent machine Vernor Vinge and others imagine as arising in the Singularity. Their chiseled, muscle-bound bodies suggest pervasive perfection: they are finely tuned machinery in the form of the ideal human physique. RoboCop, on the other hand, is closer to Stelarc's posttranshuman: he is aware that he is damaged goods, pieced together from fragments of man and machine, and becomes increasingly pensive as his memories begin to surface and he considers the in-betweenness of his life, body, and intelligence.

Stelarc's *Third Hand* channels these science-fiction fantasies, powerful and even dangerous in the acrylic shell that showcases its robotic gears and cables. However, instead of baring the chiseled muscles of Batty, RoboCop, or the Terminator, the wearer of this cyborgian prosthetic is the thoroughly ordinary-looking; balding, yet otherwise rather hairy; middle-aged artist (fig. 16). The contrast is only intensified by the black portrait background of the studio shots showcasing the Third Hand and Stelarc's theatrical poses. What is on display here is not the sci-fi fantasy, but the awkward and cumbersome reality of this extraneous extension of the self.

Mexican performance artist Guillermo Gómez-Peña highlights both the fantasy and the awkwardness of the robotic prosthesis in what Jones describes as "a direct parody of Stelarc's heroicized robotic performances." Here Gómez-Peña's "El Mad Mex" character wears what he describes elsewhere as "My robotic, cerbo-controlled hand … with polished chrome and lasers for fingertips" (though, he clarifies, "It's just for style") (fig. 17).[473] In the 2000 performance Jones describes, however, this hand (in reality a plastic toy) turns on him, pulling at his mouth. Gómez-Peña directly references Stelarc in his diary notes for the piece, which Jones quotes: "What if Stelarc had been born in Tijuana? His second (robotic) hand suddenly would betray him and deform his identity *que no?*"[474] The whimsy and theatricality of Gómez-Peña's performances nonetheless highlight the darker realities of technology as potentially uncontrollable and as distinctively unevenly globally distributed.

Gómez-Peña's parodic piece forms one end of a spectrum, with the *Third-Hand*-ed Stelarc in the middle and Hollywood's chiseled science fiction characters at the other end. Compared to RoboCop, Stelarc's technological enhancements appear laughably meager, the expanse of his soft flesh almost shameful under comparison with the former's gleaming carapace. Compared to Gómez-Peña, Stelarc fares better; the "enhancement" the former wears not only lacks the fine sensors and controls of Stelarc's, but then actively turns against him. Considered together, this triplet represents a whimsical continuum that brings a dose of embodied reality to all three.

Stelarc takes the idea of robotic "enhancement" even further in his *Exoskeleton: Event for Walking Machine* performance, in which he is strapped onto the prosthesis, rather than vice versa (fig. 18). Stelarc developed *Exoskeleton* during a residency he

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[473] Gómez-Peña in collaboration with Roberto Sifuentes and Matthew Finch, *Aztechology* "performance interview" transcript, 1998. Online at http://www.pochanostra.com/antes/jazz_pocha2/mainpages/page2.htm.
[474] Jones, 190.

completed in Hamburg, with the assistance of a group of artists and engineers known as F18,[475] and first performed it there in late 1998. *Exoskeleton* places the artist in the center of what looks like a giant mechanical insect, with six jointed legs sprouting a profusion of cables. Nested amidst these legs, the artist stands on a rotating platform, a tall column behind him connected to a bundle of power cables hanging from the ceiling. The column provides structures that brace the artist's arms, which he uses to control the movement of the machine. His right arm is extended with attenuated, mechanical fingers that flutter with alien dexterity. The column behind the artist also provides a waist belt that stabilizes him against *Exoskeleton*'s spastic lurching, which nonetheless shakes him t around. Indeed, the vibrations produced by the force with which the limbs strike the floor necessitated that this be, in Stelarc's words, "the first performance I did with my clothes on"; shockproof boots were clearly essential, and he opted to dress as well.[476]

In addition to providing locomotion, *Exoskeleton* functions as what Stelarc calls a "sound machine," creating metallic, industrial sounds with each movement. In a video of the performance, the wheezing, grinding, and clicking of the machinery echoes off the concrete walls and floors, a flood of sound accompanying the convulsions of the machine as it reels forwards and skitters sideways. Even fully clothed, the artist appears small, vulnerable, and at the mercy of the machine he ostensibly controls. If the *Third Hand* can be compared to Terminator, providing a visual suggestion that mechanical body parts are destined to become part of the insufficient and outdated human machine, *Exoskeleton* is closer to Robocop, in which the human—or what remains of it—is transported and strengthened by the machine. In those science fiction imaginings, of course, the

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[475] *Stelarc: The Man With Three Ears*. Nick Ahlmark, Director. (Vice Television Ltd., 2009). http://www.vice.com/motherboard/stelarc-the-man-with-three-ears--2.
[476] Warwick video.

connections are seamless, smooth, and powerful—a direct contrast to Stelarc's jouncing atop the juddering *Exoskeleton.*

Stelarc's performances with these technologies of bodily extension –particularly given his claims about the needs of the body to keep up, physically, with a digital world that is passing it by—might superficially be read as emphatically transhumanist, were not the awkwardness of their interfaces and contrast with the emphatically embodied nature of the artist not so prominently on display. Again, we can read apparent "failures" here—of the *Third Arm* to be wearable for longer than just performances; of the seizing *Exoskeleton* to run smoothly and efficiently; of the artist's body to more closely resemble the HARD, HOLLOWED, machinic body of science fiction cyborgs—but what is really on display is how posttranshumanism looks in practice.

The Networked Posthuman

The *Third Hand* and *Exoskeleton* cast Stelarc as a cyborg, intimately connected to machinery that he controls with his own body. In the performances to which I now turn, a series Stelarc refers to as the "Involuntary Body," the equation shifts as Stelarc transfers control over his body to external sources. In these performances, completed between 1995 and 1998, he is not, I argue, merely cyborg, but a posthuman figure in the posthuman*ist* vein Cary Wolfe describes—despite the latter's aversion[477] to the transhumanism with which Stelarc's work has been associated.

I began this chapter with the characterization of Wolfe's definition of posthumanism as a perspective. Wolfe conceives of posthumanism through the lens of second-order systems theory, specifically as read through German sociologist Niklas Luhmann and

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[477] Sentences such as "Long before the historical onset of cyborg technologies that now so obviously inject the post- into the posthuman in ways that fascinate the transhumanists" make clear his sentiments on the subject. (xx)

Jacques Derrida.[478] Luhmann calls his systems theory, nodding to Derrida's best-known theoretical contribution, "the reconstruction of deconstruction."[479] The critical intervention Wolfe reads in Luhmann is the recognition and inclusion of "biological, social, and historical conditions of emergence and transformation" in understanding the connections in social and psychic systems.[480] These networks define and create our understanding of nature, self, and society, which, as Wolfe points out, are neither separate spheres nor possible to disentangle.

For Wolfe, the question of the posthuman is how we can think about what it means to be human from a position that isn't entirely anthropocentric and humanist—to think from outside the networks we use to define ourselves as human, while remaining aware of our entwinement within them and definition by them. As he puts it,

> Posthumanism can be defined quite specifically as the necessity for any discourse or critical procedure to take account of the constitutive (*and* constituively paradoxical) nature of its own distinctions, forms, and procedures—and take account of them in ways that may be distinguished from the reflection and introspection associated with the critical subject of humanism. The "post-" of posthumanism thus marks the space in which the one using those distinctions and forms is not the one who can reflect on their latencies and blind spots while at the same time deploying them. That can only be done… by another observer, using a different set of distinctions—and that observer, within the general economy of autopoiesis and iterability, need not be human (indeed, from this vantage, never was "human").[481]

As Wolfe points out in the above passage, however, finding a place outside one's own system from which to observe it is essentially impossible (in the same way that Luhmann says communication is impossible: "Humans cannot communicate; not even their brains

478 Luhmann's second-order systems theory follows the first-order iteration by Norbert Weiner, which was discussed briefly in Chapter 1. Wolfe, 3.
479 Quoted in Wolfe, 8.
480 Wolfe, 8.
481 Wolfe 122.

can communicate; not even their conscious minds can communicate. Only communication can communicate."[482]). Individual, self-generating (autopoetic) psychic systems, within what Chilean biologist/philosophers Humberto Maturana and Francisco Varela call their "embodied action," together "bring forth a world," one necessarily different for every living being.[483]

The idea that every living being creates its own environment, and even its own time, is one German biologist Jakob von Uexküll advanced in his 1933 book *Streifzüge durch die Umwelten von Tieren und Menschen*, recently published in English as the 2010 *A Foray Into the Worlds of Animals and Humans*.[484] In his introduction to the latter, writer and sleight-of-hand magician[485] Dorion Sagan writes that Uexküll's idea of *umwelt* (environment, in German) was

> popularized and developed by [semiotician] Thomas Sebeok, who spoke of a "semiotic web"—our understanding of our world being not just instinctive, or made up, but an intriguing mix, a spiderlike web partially of our own social and personal construction, whose strands, like those of a spider, while they may be invisible, can have real-world effects.[486]

Uexküll doesn't stop at human perception, either, but explores the realities—subjective and self-created—of living organisms from ticks to flowers. An object carries "meaning " based on its particular environment, and an organism's reality is defined by its interaction with that environment. As Uexküll puts it, "all the properties of things are nothing other than the perception signs imprinted upon them by the subject with which they enter into a relation."[487] This concept of *umwelt* is profoundly posthumanist in that it completely

[482] Quoted in Wolfe, 19.
[483] Quoted in Wolfe, xxiii.
[484] Joseph D. O'Neil, translator (Minneapolis: University of Minneapolis Press).
[485] I have yet to find a biographical statement that doesn't mention the latter.
[486] "Introduction," 4.
[487] Uexküll, 201.

decenters the human subject, replacing a world in which all objects and organisms are oriented toward rational human perception with a far more complex web populated with infinite versions of time and reality.

Wolfe doesn't cite Uexküll, but his influences[488] are nonetheless felt in the former's description of a world that is, because of the autopoietic nature of the systems delineating it, simultaneously virtual and real. Wolfe writes that if we follow Maturana and Varela's concept of organisms' "embodied enaction" generating unique environments that may be, in Wolfe's words, "*radically* different, for different life forms," then

> the environment, and with it 'the body,' becomes unavoidably a virtual, multidimensional space produced and stabilized by the recursive enactions and structural couplings of autopoietic beings who share what Maturana and Varela call 'a consensual domain.' …The world is thus a virtuality and a multiplicity; it is both what one does in embodied enaction and what the self-reference of that enaction excludes. Again, Luhmann: 'Reality is what one does not perceive when one perceives it.' Crucially, then, 'virtual' does not mean 'not real'; on the contrary, given the 'openness from closure' principle, the *more* virtual the world is, the *more* real it is, because the buildup of internal complexity made possible by autopoietic closure actually *increases* the complexity of the environment that is possible for any system.[489]

The principle of "openness from closure" is one Wolfe identifies in Luhmann's reading of Maturana and Varela on biological systems, which "must maintain their boundaries and integrity through a process of self-referential closure," yet be open to the environment precisely in order to do so.[490] Because an object and its environment are in a sense called into being by each other, these self-defining and -creating systems increase in complexity within that relationship. Both are "virtual," in that their existence is predicated upon the meaning they hold for other objects in the system. Yet they define

[488] Uexküll's readers include Heidegger, Deleuze and Guattari, and Agamben. ("Introduction," 4).
[489] Wolfe, xxiii-xxiv.
[490] Wolfe, 111.

the real, for Luhmann, by being precisely that which "one does not perceive when one perceives it."

After setting up his interpretation of posthumanism in the first half of the book, Wolfe dedicates the second half to "engaging in detailed readings and interpretations of a range of cultural and artistic practices that exemplify a posthumanist sensibility or problematic."[491] These include Sue Coe's *Dead Meat* and Eduardo Kac's *GFP Bunny*, as might be expected from a scholar whose work has contributed to the emerging discipline of Animal Studies. In addition, he addresses non-traditional architecture with Rem Koolhaas and Bruce Mau's *Tree City* plan and Diller + Scofidio's amorphous *Blur* building; film with Lars von Trier's *Dancer in the Dark;* and the relationship between analog and digital media in David Byrne and Brian Eno's collaboration *My Life in the Bush of Ghosts*. Given his earlier distancing of himself from transhumanism or anything too close to it, it is not surprising that none of these projects addresses the idea of the *posthuman*—an imaginative figure or provocation that explores, through directly addressing the body (whatever it may mean—and which Wolfe is keen not to dismiss entirely) the implications for being human in a posthumanist milieu. I offer Stelarc, and particularly his Involuntary Body series to which I now turn, as a way to understand a material (yet virtual), embodied, posthuman.

The Involuntary Body: *Fractal Flesh, Ping Body,* and *Parasite*

In his Involuntary Body performances, Stelarc pairs electrodes with complex computer systems to deliver current to different parts of his body, automatically activating those muscles, as outlined in a 1993 drawing (fig. 19). A faceless male body, a prosthetic right hand extending from his own, stands covered in electrodes and draped in

[491] Wolfe, xxx.

the cables sprouting from them. To the left of him a legend identifies the numbers that label various input and output sites on the body, divided into the categories "Amplified Body," "Involuntary Body," and "Third Hand." The twelve items listed under Amplified Body include sensors for limb position, muscle flexion, and more. The Involuntary Body section lists the locations of electrical muscle stimulation (EMS) electrodes that activate different muscle groups. The Third Hand section lists the locations where muscles control the four functions of the hand, as well as where the hand's sense of "touch" directs.

The body this drawing describes is one that is enhanced, extended, and intimately integrated with technology. Yet even in this cleanly diagrammed form, the effect is less of triumphant sci-fi hero and more of a soft body ensnared and invaded by foreign elements. If nothing else, this particular configuration—like the heavy *Third Hand* also displayed and earlier discussed—is patently impractical for anything other than a stage performance. Stelarc had previously performed using the *Third Hand, Amplified Body*, and electrical muscle stimulation, both individually and in concert, but it was in the Involuntary Body performances that the three not only came together, but employed the element of external, divided, control. The result is what Stelarc describes as a "split body" or "split physiologies, operating with multiple agency,"[492] and first occurred at Telepolis in Luxembourg in November of 1995 in the performance *Fractal Flesh*.[493]

[492] "Parasite Visions: Alternate, Intimate and Involuntary Experiences," *Stelarc: Political Prosthesis & Knowledge of the Body,* Marina Gržinić, Editor (Ljubljana: Maska, 2002), 16.

[493] Due to the number of, variations upon, and similarities between the Involuntary Body performances, it is challenging to catalog a precise timeline of them, especially since Stelarc's own writings at times seem contradictory. In "Parasite Visions," he indicates that the first of the Involuntary Body performances occurred at Telepolis in 1995 (17)—a date misidentified, later in the same article, as 1985 (27). He names this first performance, both in "Parasite Visions" (27) and in the list of "Performances, Projects, Exhibitions and Presentations" maintained at his official website, *Fractal Flesh.* However, its inclusion in "Parasite Visions" under the heading "Ping Body/Proto-Parasite" has led several scholars, including Amelia Jones and Jane Goodall, to mislabel that first Teleopolis performance, which did *not* utilize Internet ping data, *Ping Body*. Additionally, "Performances, Projects, Exhibitions and Presentations" lists a

In *Fractal Flesh*, Stelarc appeared on stage in Luxembourg, wired up as shown in the diagram for the performance. In this diagram, the male figure from the *Involuntary Body/Third Hand* drawing reappears, this time schematically linked to a system captioned "Touch-screen Interface & Muscle-Stimulation Circuitry" (fig. 21). On the left, a computer, its touchscreen monitor displaying a simplified figure labeled with six black squares, links to more systems, one input and one output. In the former, rays with terminus points numbered from one to six, indicating "Remote Actuation Sites," converge on a box labeled "Internet Upload," which in turn feeds into the computer. On the output end, a rectangle framing the touchscreen figure, now with the six squares numbered, indicates a relay delivering data to the *Involuntary Body* figure.

The interface diagrammed here is *Stimbod*, through which individuals at remote sites—in this case the Centre Pompidou in Paris, the Media Lab in Helsinki, and the Doors of Perception conference in Amsterdam—could choreograph, via the Internet, Stelarc's motions in Luxembourg (fig. 22)[494] In the artist's words, the sites "were electronically linked using modem connected Macs with picturetel ISDN channels providing visual feedback so that people could remotely access and actuate the body."[495] That actuation was accomplished via the EMS electrodes the artist wore on both biceps, as well as on his left shoulder, forearm, quadriceps, and calf. Stelarc maintained control of his head; right leg (a necessity for maintaining balance); and his torso, through which he controlled the *Third Hand* (fig. 22). The electrodes delivered a charge of between zero and 60 volts over several seconds, an experience the artist described in a rare, yet

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performance of *Fractal Flesh* at the Meridian Gallery in Melbourne on August 22, 1995, but there is no record of it involving the global participation that occurred a few months later in Luxembourg.

[494] "Parasite Visions," 27.

[495] Ibid, 62.

pointedly impersonal summary: “The tingling, burning sensation of the stimulation has been described as producing a cramp-like experience as the muscle contracts. At a lower voltage level, it is merely a prompting system. At higher voltages, the limb moves involuntarily.”[496] Here, although the focus remains on the body as a machine to be controlled, we have at least a small admission of the discomfort suggested by the diagram and experienced by *being* “the body” in question.

The artist, naked but for the *Third Hand*; electrodes, sensors, and attendant wires; and (in some performances) a head-mounted display, performed against a grid of nine screens displaying live video in a composite image. Live images of the performance were uploaded to a Web site, while Stelarc’s HMD “allow[ed] the artist to see the face of the person programming him—an intimacy,” as he put it, “without proximity.”[497] All the while, sonic feedback from the “Amplified Body” sensors provided a steady soundtrack of whirring, pulsing, and creaking, which intensified the effect suggested by the headline of Lisa Spencer’s *Independent* newspaper article on the performance: “The Naked Robot.”[498] Stelarc’s spastic movements, his electronics-enshrouded form, and the industrial soundtrack all evoke the mechanical humanoid that the word robot today suggests, an image that contrasts with, in the first words of Spencer’s article, Stelarc’s “flabby, balding” body: bare and vulnerable.

In *Ping Body,* as in *Fractal Flesh*, Stelarc is again on stage—physically, as well as live on the Internet—while his muscles are controlled by external forces. This time, however, it is not individuals activating his muscles from multiple touchscreens, but the

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[496] Stelarc, “Parasite Visions,” in *Stelarc: Political Prosthesis and Knowledge of the Body*. (Ljubljana: Maska, 2002), 27.
[497] Ibid, 27.
[498] Lisa Spencer, *The Independent*, London. 13 October, 1996. Online. http://www.independent.co.uk/arts-entertainment/the-naked-robot-1358265.html

flow of data itself: “ping” data from across the Internet. Ping is a program its developer, Mike Muus, likens to echolocation (with the onomatopoetic ping of sonar the program’s eponym). However, instead of measuring physical distances using sound, ping indicates “distances” in cyberspace by sending data “packets” to a target computer and measuring the return time.[499] Ping data, then, reflect user traffic across the Internet as computers exchange data. According to Stelarc, describing the 1996 Digital Aesthetics performance in Sydney, “By pinging over 40 global sites live during the performance and measuring the reverberating signals, it was possible to map these to the body’s muscles with the muscle stimulation system” (fig. 23). He continues, “The body becomes a data dance; it becomes a barometer of Internet activity.”[500] It was individuals—art-minded gallery-goers and conference attendees, at that—who choreographed Stelarc’s movements in *Fractal Flesh*. Through the HMD, he was able to see them as they activated his body with their own, affording the aforementioned “intimacy without proximity.” Yet in the *Ping Body* performances, which occurred in different variations between 1996 and 1998, Stelarc relinquishes control of his body not just to another body, but to *no*body at all. In this performance, he gives form and body to the Internet, which in 1996 was just entering the public consciousness, yet was already redolent of its own imminent ubiquity. In 1984’s *Neuromancer,* William Gibson[501] pictured Cyberspace as a locus for interaction not merely between the space cowboys who jacked in to navigate its flow of data, but by the Artificial Intelligences borne by it. Stelarc here makes his body—the breathing,

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[499] Muus, Mike. “The Story of the PING program.” Hosted online by the United States Army Research Laboratory. http://ftp.arl.army.mil/mike/ping.html.
[500] “Parasite Visions,” 27.
[501] Who has himself followed Stelarc’s work and wrote the Foreword to the latter’s monograph. Marquard Smith, Editor, (Cambridge: MIT, 2005).

perspiring, twitching "meat prison" that hacker Case so disdains—the physical manifestation of that data. He literally embodies Cyberspace.

Stelarc first performed *Parasite*, the third in the Involuntary Body series, in early April of 1997 at an international multimedia event called Virtual World Orchestra (fig. 24). Its organizers, NVA (Nacionale Vita Activa), called it "the first genuinely global internet event," and one can almost hear their breathless excitement as they describe the three-evening experience. "Glasgow's Old Fruitmarket," they write,

> was transformed into a vast, pulsating, techni-coloured, techno-saturated, audio-visual arena ... literally playing host to the world. Images, sounds and text from representatives of over 160 countries (more than half the countries in the world), ranging from Iceland to Mongolia, careered through the internet, packaged by Locofoco and Tomato (the indefatigably hip Soho design collective), and were blasted onto sculptor (and gyneacologist!) Dr. Graeme Tydeman's awesome configurations of screens - suspended, surrounding and shifting around this epic event. A spectacular digital montage of global life, VIRTUAL WORLD ORCHESTRA (VWO) was theatre company NVA's (Nacionale Vita Activa's) bid to make sense of that which unites and divides humanity, and fittingly crossed all boundaries - national, cultural, political, even generic, as the evening hurtled from clubland to installation art, from concert to performance art. For three nights and into the small hours, a live audience and a potential 30 million viewers worldwide watched the simultaneous internet and m-bone[502] broadcasts, embarked on a multi-layered voyage through the rich diversity of global life and became a part of the first genuinely global internet event. Added to all this was live Betacam mixing onto mutiple moving screens, aerial staging, quadrophonic sound, robotics, mass drumming, individual performances and DJ's mixing sound sequences from 'found sounds' provided by an international bevvy of musicians, and produced at nva's digital recording studio-One Over Infinity.
>
> VWO proved to be as unparalleled as it was unprecedented.[503]

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[502] Mbone, which stands for "multimedia backbone," is a technology now rendered largely obsolete by the expansion of the Internet itself, but which in the 1990s provided the "backbone" for otherwise impossible real-time multimedia presentations and events. See Kevin Savetz, Neil Randall, and Yves Lepage, *MBONE: Multicasting Tomorrow's Internet* (1996), now online at www.savetz.com/mbone/, and Peter H. Lewis, "Peering Out a 'Real-Time' Window," *New York Times* (February 8, 1995).

[503] Nacionale Vita Activa, "Virtual World Orchestra: The Show." Online at http://www.nva.org.uk/vwo/vwo_show.html.

The excitement palpable here lies not just in the diversity or even scale of the project, but in the fact that it is being facilitated by cutting-edge technology with the potential to unify global humanity. These are the hippest of the geeks—the sort iconized in 1995's *Hackers*: precocious, attractive but misfit, youths enthralled by the possibilities (licit and il-) offered by technology still in the Wild West phase Gibson had imagined in *Neuromancer* (fig. 25). (Passages depicting the protagonists hacking into systems show a cyberspace clearly indebted to Gibson's, with glowing skyscrapers of data rising from circuit-board highways.) As Rafael Moreu, who wrote *Hackers*, says of the film's characters and what they represent, "Hacking itself is just part of something that's much bigger. In fact, to call hackers a counter culture makes it sound like they're a transitory thing; I think they're the next step in human evolution."[504] These youth represent a new generation of technological initiates—"digital natives," as author and educator Mark Prensky calls them[505]—and technology is their playground and podium.

Against this backdrop, Stelarc, and particularly in a performance like those in the Involuntary Body series, harnessing the will of the crowd and even Cyberspace itself, seems a natural fit (if, at the moment 51, the artist is perhaps a bit older than the mean). However, in what feels like a direct contrast to the optimistic tone of the event, he entitles his performance, debuting at VWO, *Parasite*—a word with distinctly negative connotations. The subtitle, *Event for Invaded and Involuntary Body*, strengthens that impression. A parasitic relationship, after all, is one that is specifically *not* equally beneficial to both organisms. Given the "invaded body" of the subtitle, one could be forgiven for assuming the Parasite in question is the technology inhabiting and

[504] Jim McClellan, "Cyberspace: The Hack Pack," *The Observer* (January 8, 1995), 69.
[505] "Digital Natives, Digital Immigrants," *On the Horizon* (Vol. 9 No. 5, October 2001).

controlling Stelarc's body. One might even think of his 1993 *Hollow Body/Host Space: Stomach Sculpture* (fig. 26), of which he writes that the "technology invades and functions within the body…. The hollow body becomes a host, not for a self, but simply for a sculpture—an alien, electronic object moving, flashing and beeping in a wet and vulnerable environment."[506] The host in *Parasite*, however, is not Stelarc's own body; rather, he writes, "Plugged in, the body becomes a parasite sustained by an extended, external and virtual nervous system."[507] The "host" here is a massive, abstract, technological and virtual realm and the "parasite" the body itself.

Parasite, as the diagram for the Wood Street Galleries performance completed later that April indicates, uses much of the same technology as *Fractal Flesh* and *Ping Body*. Again electrodes activate the body's muscles, while sensors record sounds ("generated by pressure, proximity, flexion and accelerometer sensors"[508]) the body generates voluntarily and autonomically. Instead of muscle activation occurring through a remote touchscreen or even machine communications, however, in this case the circle is completed. A "customized search engine has been constructed," Stelarc writes, which "scans, selects, and displays images to the body"—which, itself, "functions in an interactive video field" (fig. 27).[509] The web images are translated into movement of Stelarc's body. Images from the performance are in turn uploaded to the web, where they become potential fodder for the search engine. For the first time an HMD, though it has been worn in some prior performances, is here part of the diagrammatic illustration,

[506] "Parasite Visions," 26.
[507] "Parasite Visions," 18.
[508] "Parasite Visions," 19.
[509] "Parasite Visions," 18.

further emphasizing the importance of both imagery and virtuality in this piece. Stelarc writes,

> Consider the body's vision, augmented and adjusted to a parallel virtuality which increases in intensity to compensate for the twilight of the real world. Imagine the search engine selecting images of the body off the WWW, constructing a metabody that in turn moves the physical body. Representations of the body actuate the body's physiology.[510]

Here the loop, unlike in *Fractal Flesh* or *Ping Body*, closes. Image becomes data becomes body becomes movement becomes image again.

A video of the second performance of *Parasite*, which occurred on April 26 at the Wood Street Galleries in Pittsburgh, has been archived by the Studio for Creative Inquiry, which (along with the Carnegie Mellon University Department of Art and the Pittsburgh Cultural Trust) hosted the event (fig. 29). The video, which they have made available online at their own website, is a frenetic montage of Stelarc's movements, performance diagram, prostheses, and interfacing equipment, all against an insistent industrial/electronic background interspersed with musical clips. Overlaying windows appear and fade: code processing against a black screen; a glowing human outline with light-up limbs; a jointed, color-coded stick figure that spins and twirls in space; clip-art and photographs of body parts, including Stelarc's. Stelarc, shot in both close-up and in uncompromising aerial view, sweats and pants as he glissades his twitching limbs into a semi-coherent choreography, his own organicity in contrast to the shiny metal and cables of the machine. Of his Involuntary Body performances, Stelarc has said, "I wanted the effect of Alien Agency, possessing and performing with your body. I'm reconciled to the fact that in a complex technological terrain where there's multiplicity of feedback loops,

[510] "Parasite Visions," 18-19.

it's no longer meaningful to ask who's in control."[511] Indeed, the organic and the technological are here set in counterpoise, and it's not precisely clear which is indeed in control.

In the introduction to *A Foray Into the Worlds of Animals and Humans*, Uexküll directs his attention toward one of the better-known parasites, the tick. He describes how this "blind and deaf bandit" finds his prey through the scent of butyric acid, which all mammals release, and how a tick may remain dormant, awaiting this sole signal, for years.[512] He uses the tick to stage a debate between a biologist and a physiologist on "a simple question: is the tick a machine or a machine operator? Is it mere object or a subject?"[513] Uexküll argues that there is no "mere object" nor "subject," but that "Every subject spins out, like the spider's threads, its relations to certain qualities of things and weaves them into a solid web, which carries its existence."[514] The parasitic tick exists in a world of suspended animation; it perceives the days, weeks, or years before it feeds as a single "moment" ended by the arrival of the butyric acid-scented mammal (fig. 34). This arrival defines the tick's existence.

The *Parasite* performance highlights webs of modern existence, with threads that connect humans not just to each other and the so-called natural environment, but to the Real and Virtual world of machines. If anything, Stelarc's claim that the plugged-in body is a "parasite sustained by an extended, external and virtual nervous system" is today even more recognizable as the threads pull us tighter—though perhaps not in the way he expected. Stelarc asked us to imagine a figure "augmented and adjusted to a parallel

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[511] Stelarc, 2000 interview with Jane Goodall, quoted in "The Will to Evolve," *Stelarc: The Monograph*, 22.
[512] Uexküll, 45-52.
[513] Uexküll, 45.
[514] Uexküll, 53.

virtuality which increases in intensity to compensate for the twilight of the real world."[515] The images the machine sought and showed him, while translating them into the movement of Stelarc's limbs, are by today's standards small, pixelated, and of degraded quality; the Internet now overflows with high-resolution still and motion pictures. Even so, these images—viewed not, generally, through HMDs, but on screens—have yet to dim the intensity of the real world.

Instead, the newest developments in vision technology concern "Augmented Reality," a way of adding a virtual dimension to regular sight. Google Glass, a wearable, Internet-connected, integrated camera and head-up display, is at the forefront of this research and, as of early 2013, is available in prototype to street testers (fig. 35).[516] Although the technology is impressive, however—coming from a company that produces driverless cars, no less—what is most salient about the augmentation is that it is not primarily visual, but consists in the ease with which it allows one to access the technology upon which we already increasingly depend. Google has allowed for the outsourcing of memory—access and creation—of everything from phone numbers to driving directions. In this way, all of us plugged-in humans do depend on this worldwide, virtual nervous system.

Conclusion

I'd like to conclude this chapter with an introduction: Stelarc's, to his first monograph. In a departure from some of his more bombastic rhetoric, with its all-caps, "shouted" phrasing, Stelarc's introduction to "Parasite Visions: Alternate, Intimate and

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515 "Parasite Visions," 13.

516 http://google.com/glass; Nick Bilton, "A Rose-Colored View May Come Standard," *The New York Times* (April 4, 2012).

Involuntary Experiences," published in his first monograph,[517] is calm and measured as he explains some of his extended-body projects and philosophies. He seems to be addressing his critics as he writes,

> Instead of seeing the Internet as a means of fulfilling out-moded metaphysical desires of disembodiment, it offers on the contrary, powerful individual and collective strategies for projecting body presence and extruding body awareness. The Internet does not hasten the disappearance of the body and the dissolution of the self—rather it generates new collective physical couplings and a telematic scaling of subjectivity.

A telematic scaling of subjectivity. Telematics, as artist and theorist Roy Ascott, one of the pioneers of telematic art, defined it in a 1990 essay, is "computer-mediated communications networking between geographically dispersed individuals and institutions… and between the human mind and artificial systems of intelligence and perception."[518] Subjectivity on a telematic scale means "spider threads" stretching beyond what is in one's immediate environment and instead connecting to people, ideas, and machines around the world.

Michael Hardt and Antonio Negri's *Empire*, published in 2000, is another study of connections. In it, they imagine contemporary globalization as an overarching form of domination so pervasive and consuming that its structures of power become invisible, united under the "single logic of rule" of global capitalism.[519] They dub this situation Empire. Because Empire lacks a single locus of control, as colonialism had, it cannot be resisted in the way earlier forms of sovereignty could be. Yet this web of interconnected

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517 Marina Gržinić, Editor. *Stelarc: Political Prosthesis & Knowledge of the Body* (Ljubljana: Maska, 2002).
518 "Is There L ove in the Telematic Embrace?" *Telematic Embrace: Visionary Theories of Art, Technology, and Consciousness*, edited and with an essay by Edward A. Shanken (Berkeley: University of California Press, 2003) 232.
519 Michael Hardt & Antonio Negri. *Empire* (Cambridge: Harvard University Press, 2000), p. xii.

power doesn't negate individuals' (via the multitude's) potential power of resistance; it just forces them to adopt new strategies within Empire for doing so.

Hardt and Negri see the power of both navigating and resisting this new global "world system" (to borrow a phrase from Walter Mignolo[520]) as lying in what they call the "new barbarians." These new barbarians, as Hardt and Negri describe them, are individuals whose "[b]odies themselves transform and mutate to create new posthuman bodies" through "creative evolution," whose post-natural, radically mutant forms are "completely incapable of submitting to command"—yet enable the creation of a "*new place in the non-place,*" "a new mode of life" from which they can resist and "push through" Empire.[521] This change is not primarily physical; rather, the "creative evolution" they imagine is primarily concerned with resistance to biopolitical control and the ability to produce in order to circulate.[522] This occurs through the potential to render indistinct and thus denaturalize the assumed boundaries "between the human and the animal, the human and the machine, the male and the female, and so forth; it is the recognition that nature itself is an artificial [virtual, if we follow Wolfe] terrain open to ever new mutations, mixtures, and hybridizations."[523] To some extent, this transformation can be revealed physically, such as by dressing in drag, and Hardt and Negri write that

> We do certainly need to change our bodies and ourselves, and in perhaps a much more radical way than the cyberpunk authors imagine. In our contemporary world, the now common aesthetic mutations of the body, such as piercings and tattoos, punk fashion and its various imitations, are all initial indications of this corporeal transformation, but in the end they do not hold a candle to the kind of radical mutation needed here.[524]

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[520] *Local Histories/Global Design: Coloniality, Subaltern Knowledges, and Border Thinking* (Princeton: Princeton University Press, 2000), p. 23.
[521] Ibid, 215-216, 218. Emphasis in the original.
[522] Ibid, pp. 357, 363.
[523] Ibid, p. 215.
[524] Ibid, p. 216.

If invisible the spider threads of the communally-created world form complexity in the closure of their relationships, they also provide the openness that allows for that radical mutation, mixing, and hybridization. They create space for a new barbarian as posttranshuman: a non-“perfected” figure representative of the posthumanism of Cary Wolfe as well as embody-able by the Australian artist with the evil villain’s laugh.

Figure 4.1 Stelarc at the University of Southern Queensland, August 22, 2012. Photograph by Doug Spowart, http://wotwedid.wordpress.com.

Figure 4.2 Stelarc, *Ear on Arm.* Alex Phillips, http://www.theurbn.com/2012/02/ethics-of-bioart/

Figure 4.3 Surgeons place Stelarc's *Third Ear,* 2006.

Figure 4.4 Vacanti Mouse, 1996.

THIS ADVERTISEMENT IS #1 IN A SERIES ON
GENETIC ENGINEERING

Who plays God in the 21st century?

The genetic structures of living beings are the last of Nature's creations to be invaded and altered for commerce. Now they're being seized for corporate ownership. Nothing will ever be the same, and we approach the gravest moral, social, and ecological crises in history.

Earth began over four billion years ago. A billion years later the first sponges evolved out of the primordial soup. Dinosaurs emerged only 215 million years ago. The first human? Barely 50,000 years, a blip of geologic time. The industrial revolution is about 200 years old; television — 50 years; personal computers — 30 years. Genetic engineering? Less than that.

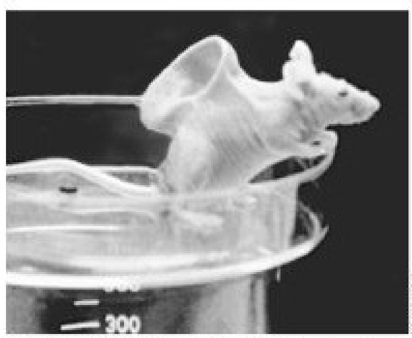
Does anyone think it's shocking, therefore, that this infant biotechnology industry feels it's okay to capture the evolutionary process, and to reshape life on Earth to suit its balance sheets? To put parts of animals into humans and vice versa? To put human genes into pigs, fish, and plants? To put fish genes into tomatoes? To put viruses and bacteria into the genetic codes of other creatures (including the AIDS virus spliced into mice)? To create plants that can't reproduce? To redesign and clone animals (and soon, humans) to fit a market function? To take over Nature's work?

When did we approve all this? Who appointed the biotech industry as Gods of the 21st century? Doesn't democracy function anymore? Why is the government supporting this with tax dollars and Clinton-Gore exclamations of praise? Have we lost our sanity?

Our society is not used to questioning technologies. But it's a skill we need to develop. Here are some issues that deserve your attention.

I. Breaking the species barrier

Whether you give credit to God, or to Nature, there is a *boundary*



This is an actual photo of a genetically engineered mouse with a human ear on its back. New pigs are also being created to accept body parts of alien species. Other mice have been designed with HIV built into their genetic code. (A report in Science Magazine says this risks a new airborne super-AIDS.) Corporate scientists praise such experiments, but there are profound unresolved moral, ethical, and health issues.

qualify *life itself* as patentable: human stem cells, human organs, and their new genetically engineered life forms.

across species using virus vectors. They can hitch rides in cars, boats and planes or in your socks. They can show up in other ecosystems. Like the Gypsy Moth, Dutch Elm disease, and Kudzu vine, "exotic organisms" can run amok and cause unparalleled environmental destruction.

There are other *truly* terrifying scenarios to at least consider. Some companies have designed GE plants that *resist* herbicides; if one such plant cross-pollinates with a weed, you could then have a pernicious herbicide resistant weed that would be nearly impossible to kill. Companies are also creating plants with sterile seeds. If a gene for sterility crosses over to other plants, you might get a mass die-off of plant life.

Finally, there are new bacteria that researchers are creating to break down plant matter into ethanol. The idea is to provide a new plentiful fuel supply. But what if such engineered bacteria escape into Nature? Could they turn *all* plant life into ethanol? If so, that would surely leave plenty of fuel, but no Nature.

* * *

In *Brave New World*, Aldous Huxley predicted a society where human beings are genetically engineered for commercial and industrial purposes. They don't protest because they are designed "to love their servitude." Has that already happened to us? Not yet!

Call us. We will provide you with more information,

Figure 4.5 Turning Point Project. "Who plays God in the 21st century?: This advertisement #1 in a series on genetic engineering." Published in the *New York Times*, October 11, 1999.

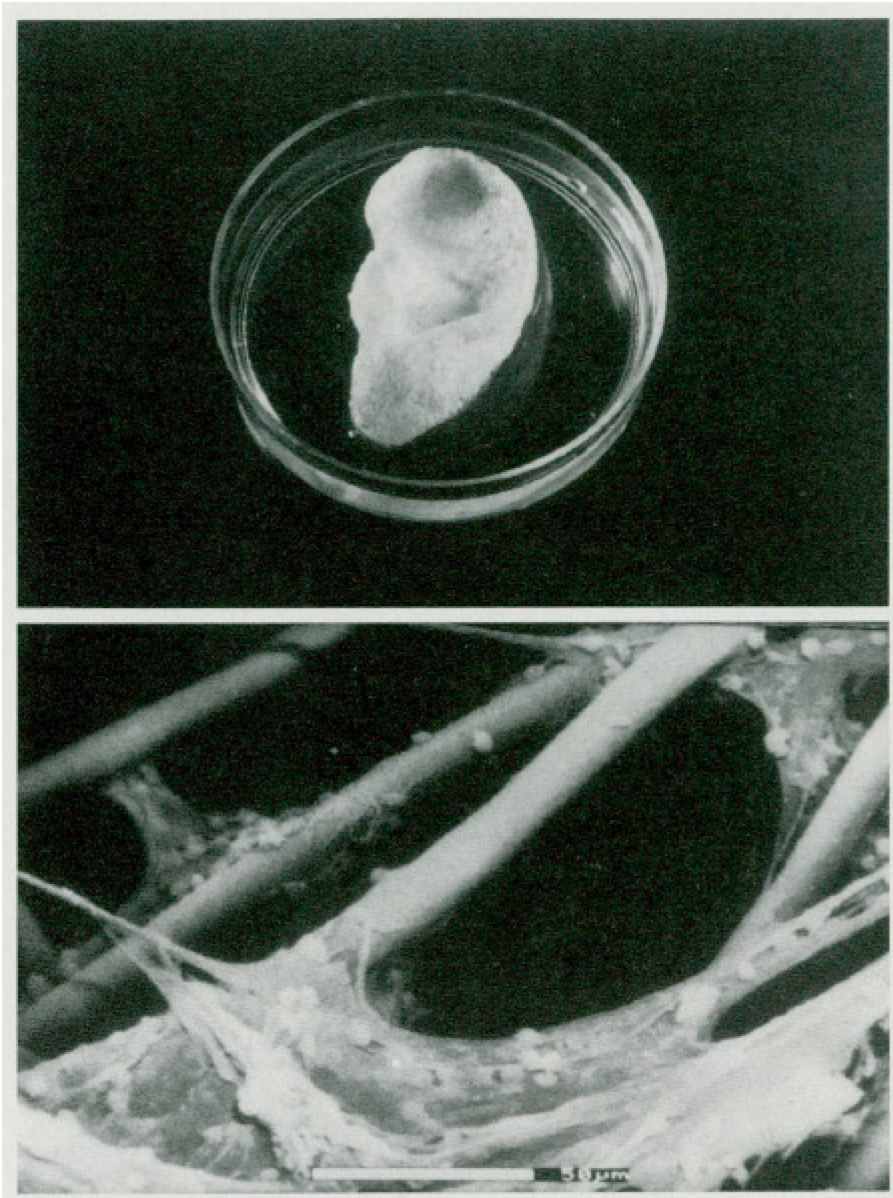


Figure 4.6 "Chondrocytes seeded onto the polymer ear mold in vitro. (*Above*) Gross appearance of the ear polymer mold seeded with chondrocytes (15x10^{7}). (*Below*) Scanning electron micrograph showing adherence of chondrocytes to polyglycolic acid device before implantation. Note the rounded configuration of the cells and the presence of extracellular matrix secreted by the cells, indicative of their ability to perform differentiated function. *(Scan provided by David J. Mooney, Ph.D.).*"

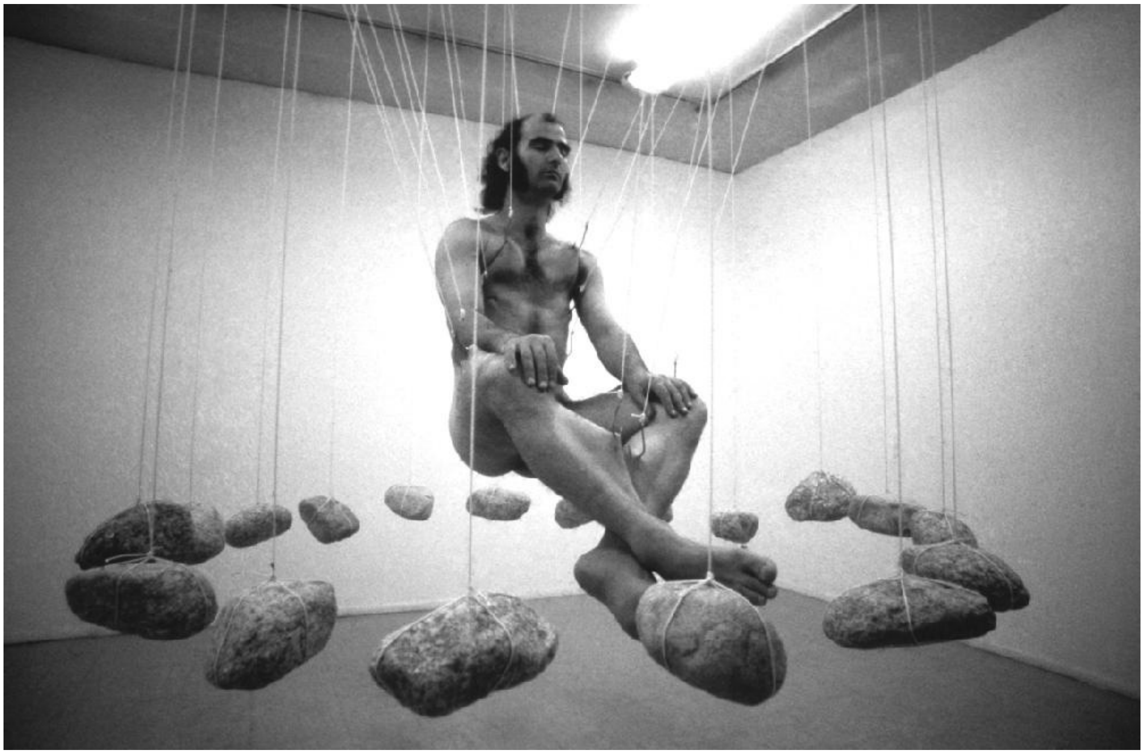


Figure 4.7 Stelarc, *Sitting/Swaying. Event for Rock Suspension.*

Figure 4.8 Stelarc, Ear on Arm Suspension, Scott Livesey Galleries, March 8, 2012. Photograph by Claudio Oryace.

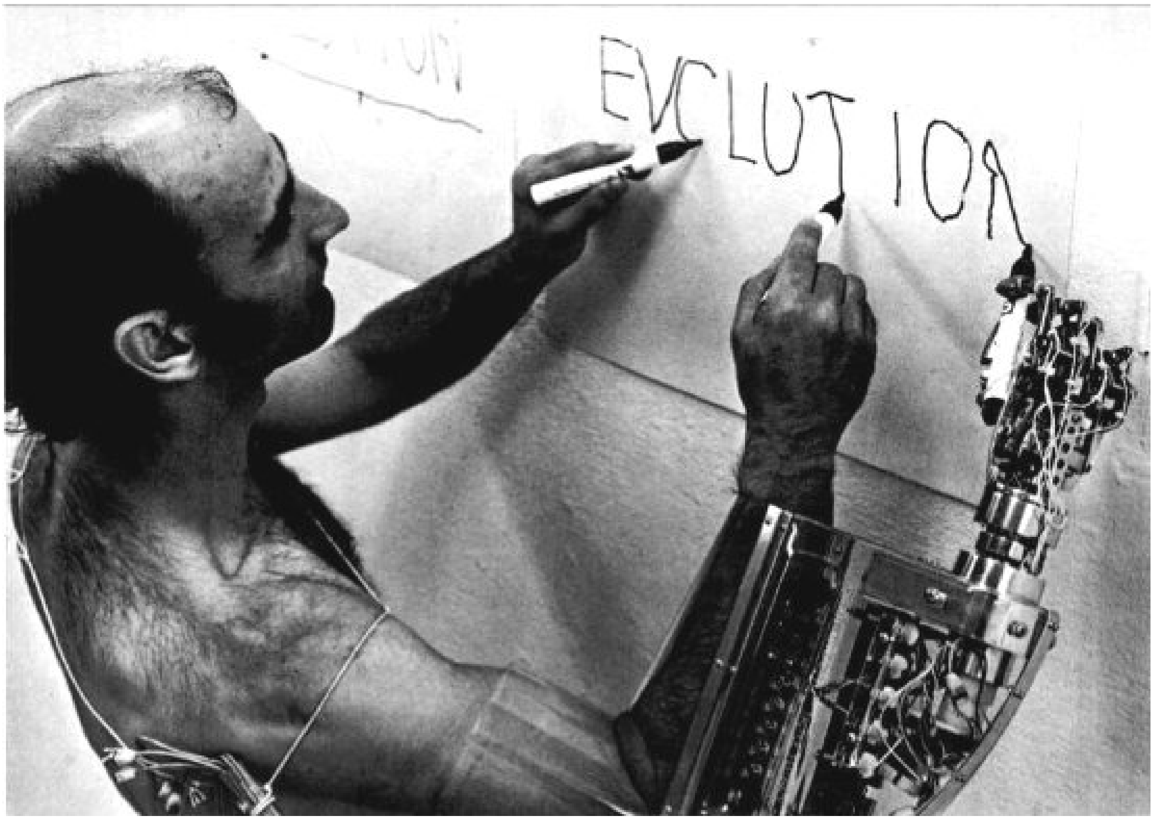


Figure 4.9 Stelarc, Handswriting "Evolution," Maki Gallery, Tokyo, 22 May 1982. Photo by Akiro Okada.

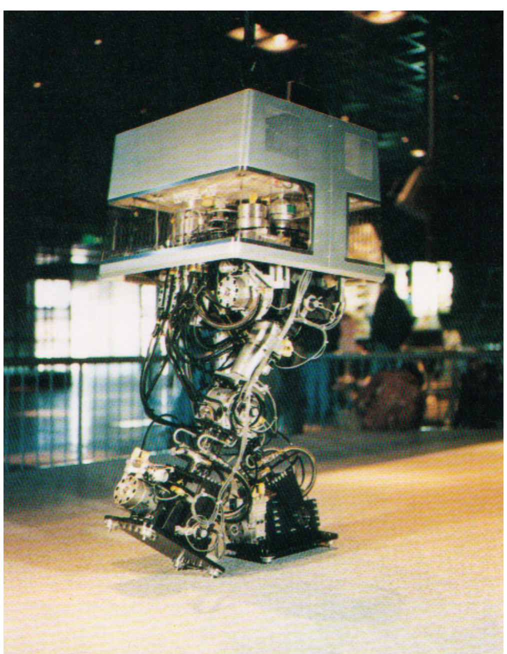


Figure 4.10 Waseda University, Bipedal Walking Robot WHL-11 at Expo '85.

Figure 4.11 WASUBOT music-playing robot at Tsukuba Science Expo '85. Image from Bill Cotter, World's Fair Photos, http://worldsfairphotos.blogspot.com/2011/01/robots-at-worlds-fairs-part-5.html

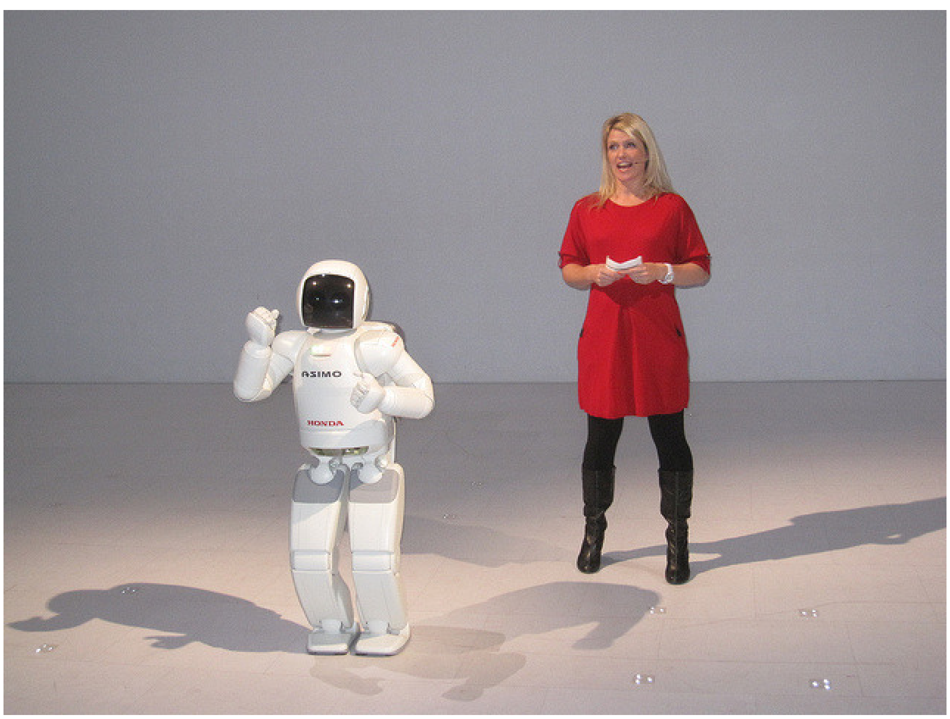


Figure 4.12 ASIMO is introduced in the Deep Space theater at Ars Electronica, 2010.

Figure 4.13 Roy Batty drives a nail into his palm in Blade Runner.

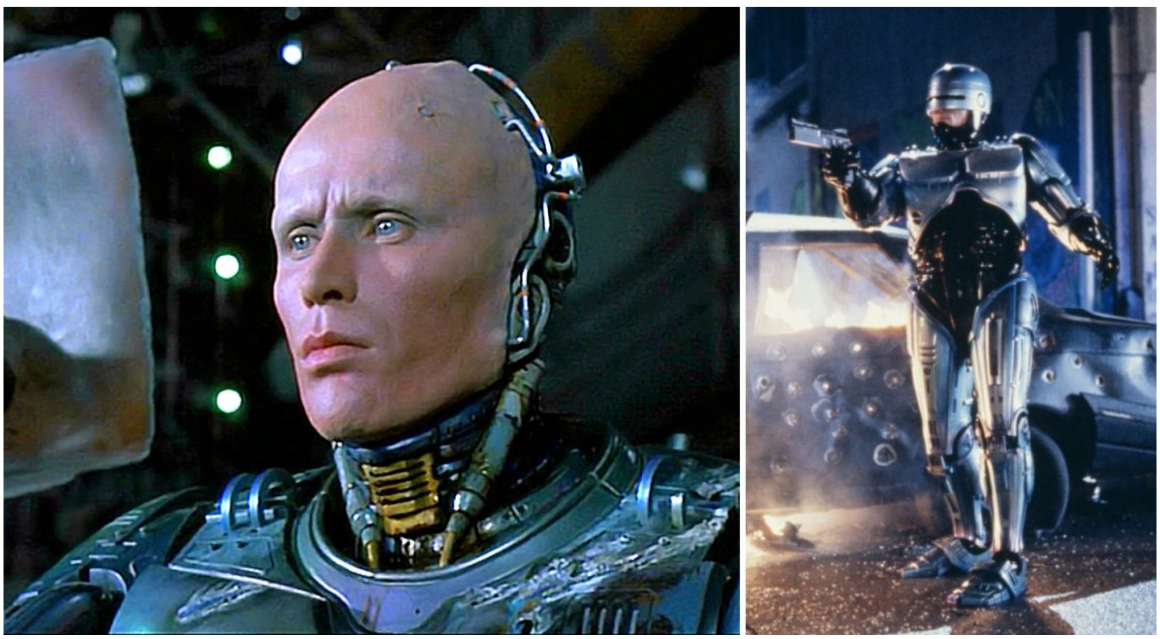


Figure 4.14 Peter Weller as *RoboCop*: seeing himself in a mirror for the first time, and in his full suit..

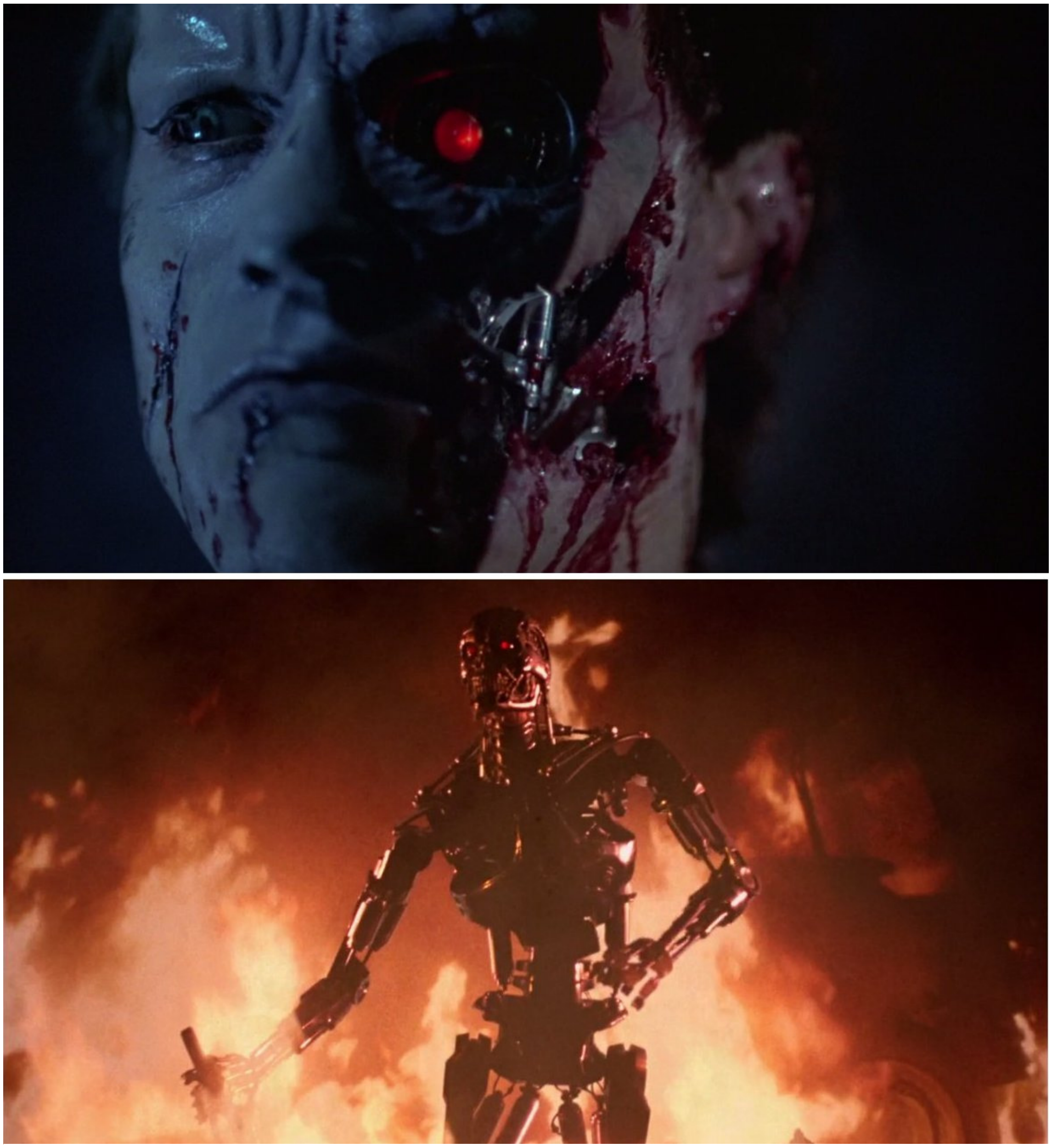


Figure 4.15 The Terminator (Arnold Schwarzenegger), with and without his organic integument.

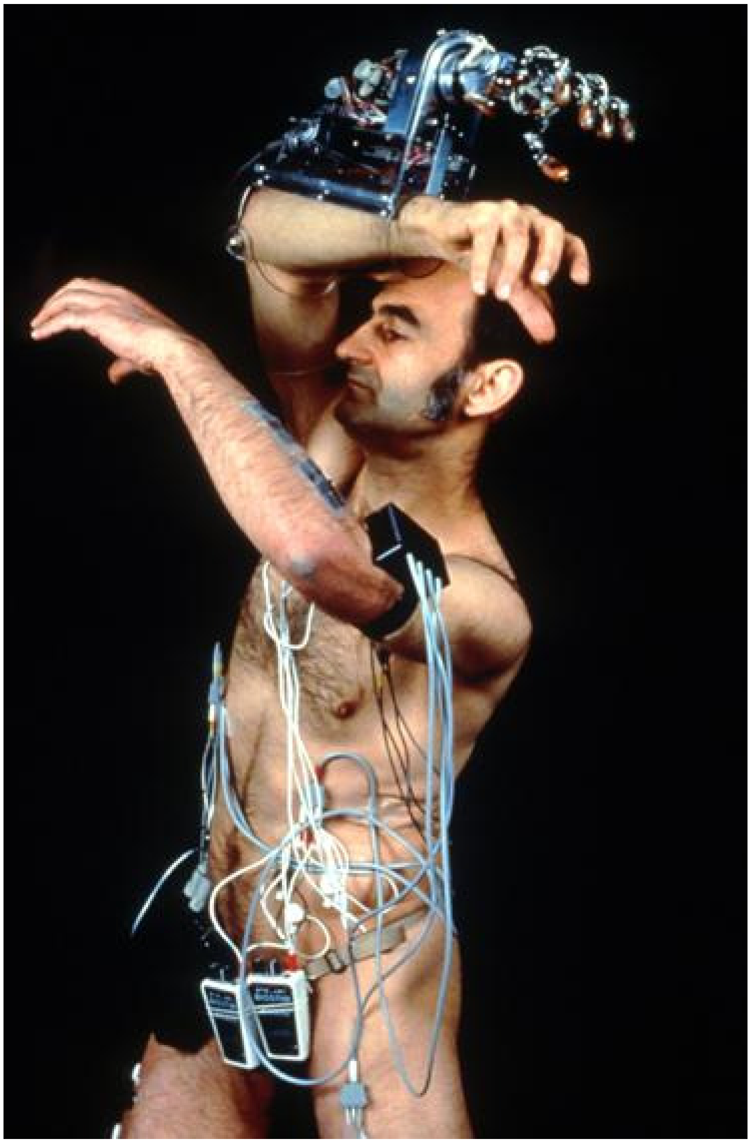


Figure 4.16 Stelarc with the *Third Hand*. Yokohama, Tokyo, Nagoya, 1980. Photograph by Simon Hunter.

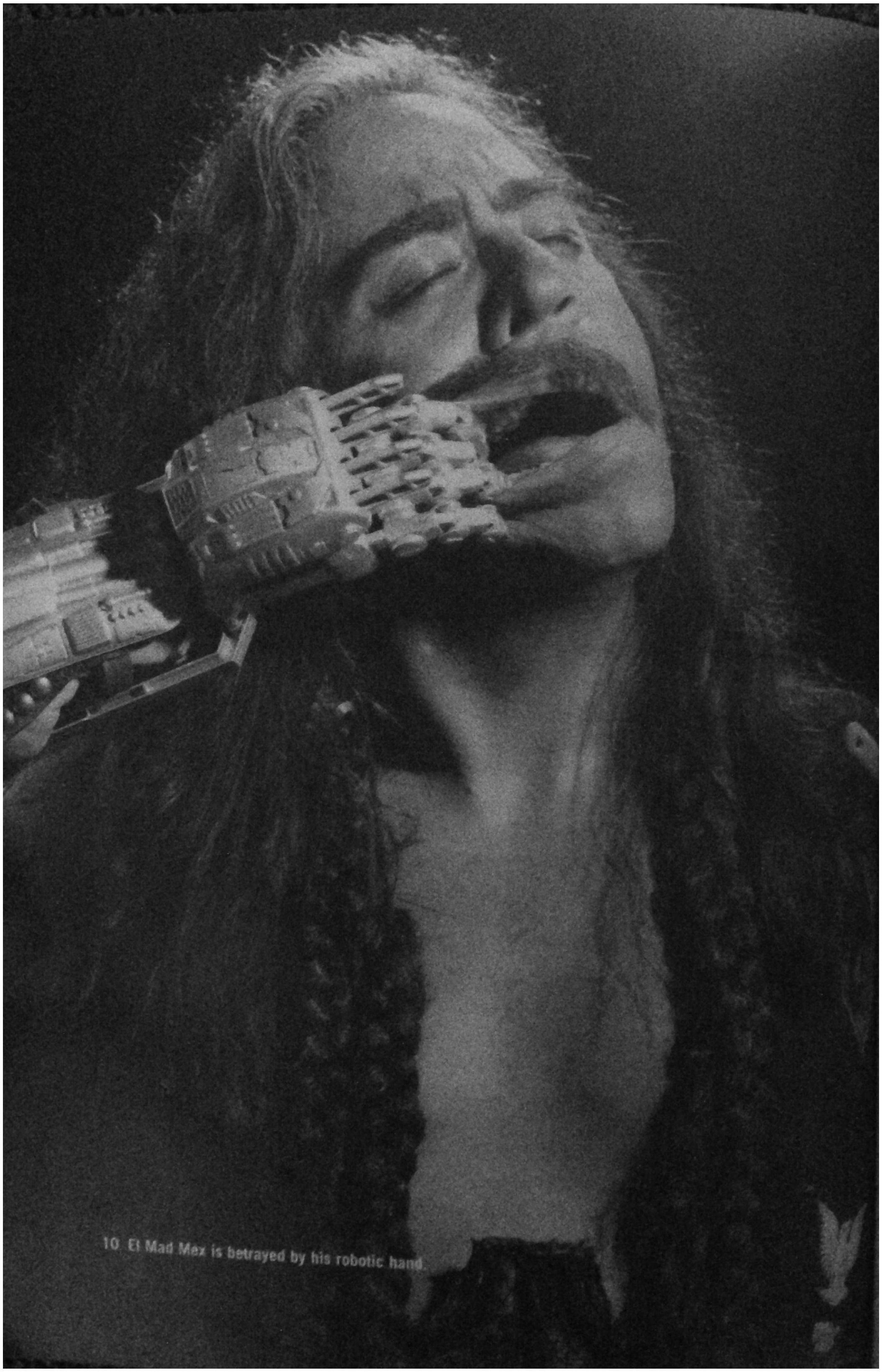


Figure 4.17 Guillermo Gómez-Peña, "El Mad Max is Betrayed by his Robotic Hand,". *Dangerous Border Crossers* New York: Routledge, 2000)

Figure 4.18 Stelarc, *Exoskeleton*, 1998.

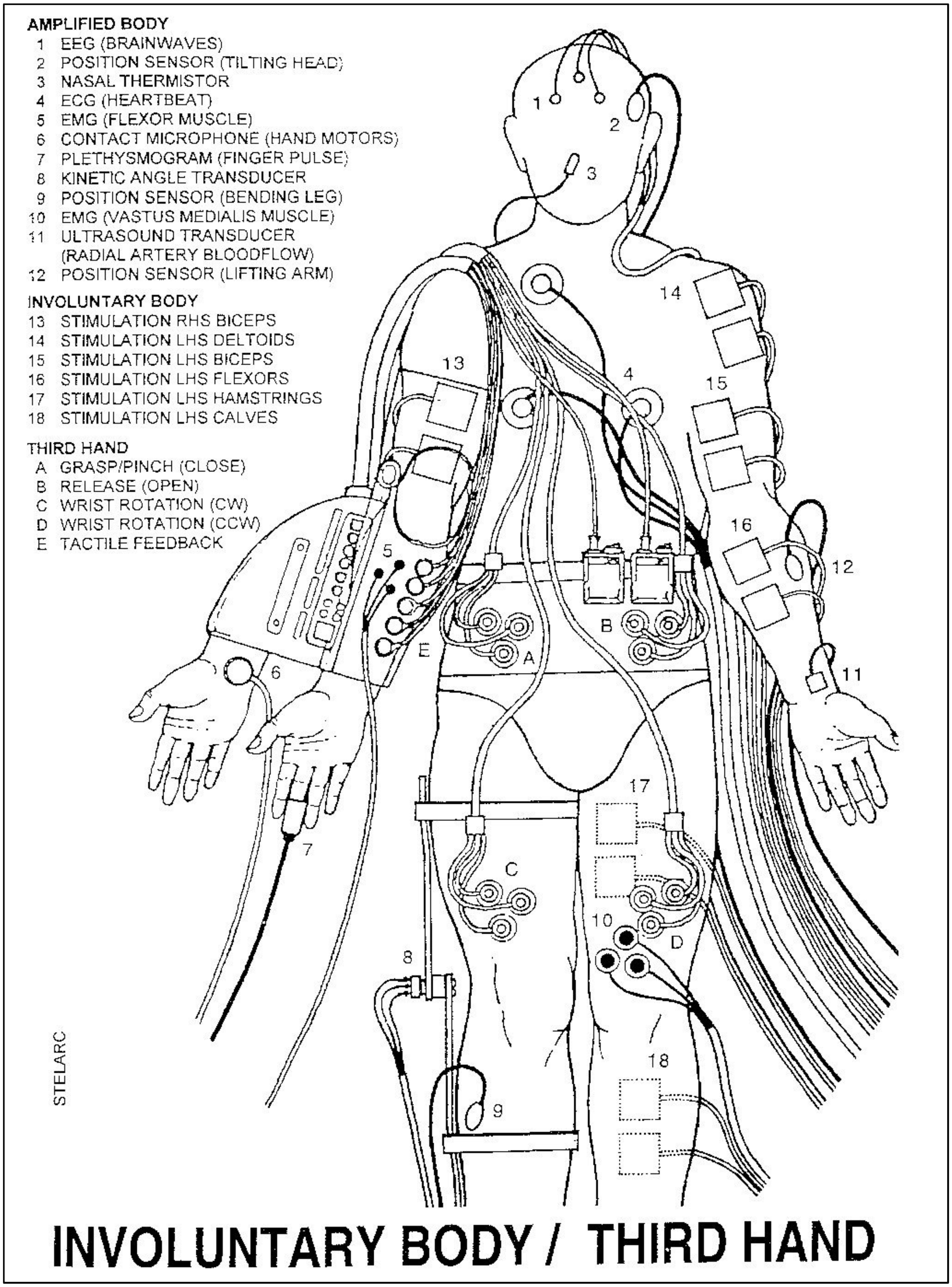


Figure 4.19 Stelarc. Diagrammatical illustration for *Involuntary Body/Third Hand*, Yokohama, Melbourne, 1993.

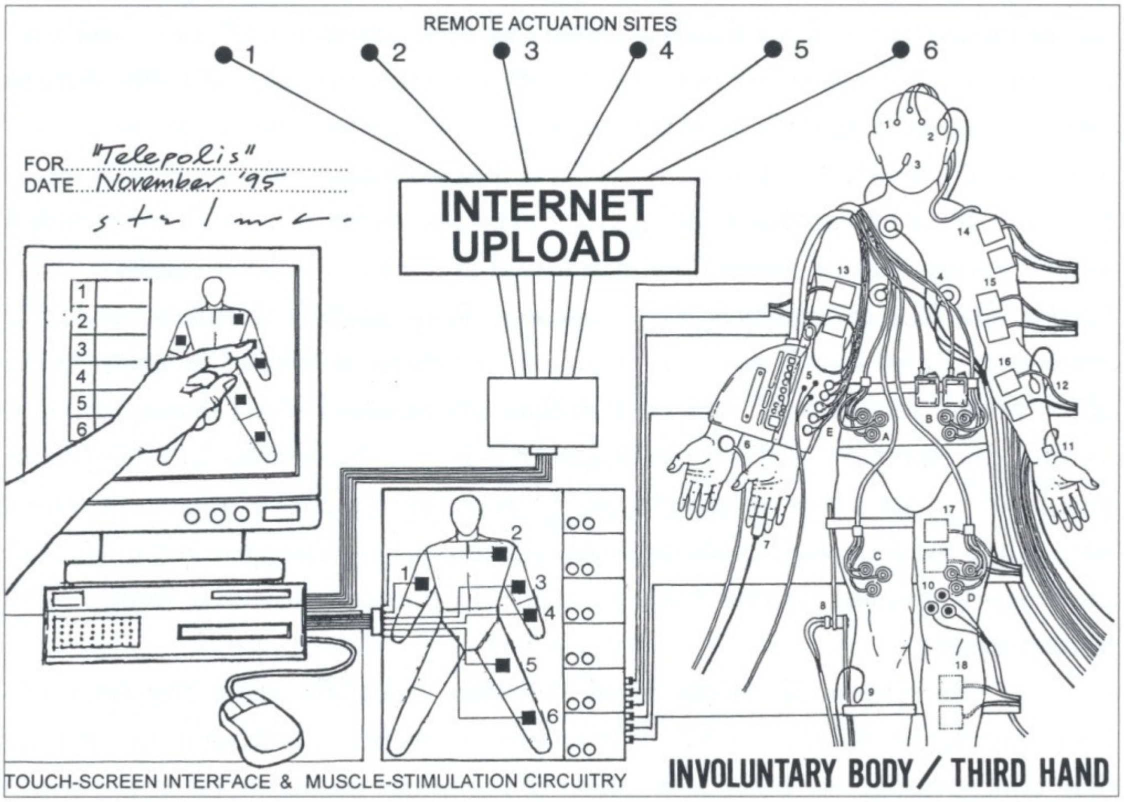


Figure 4.20 Stelarc, *Fractal Flesh, An Internet Body Upload Performance,* Telepolis, Luxemboug, 10, 11 November, 1995. Monograph, p. 57.

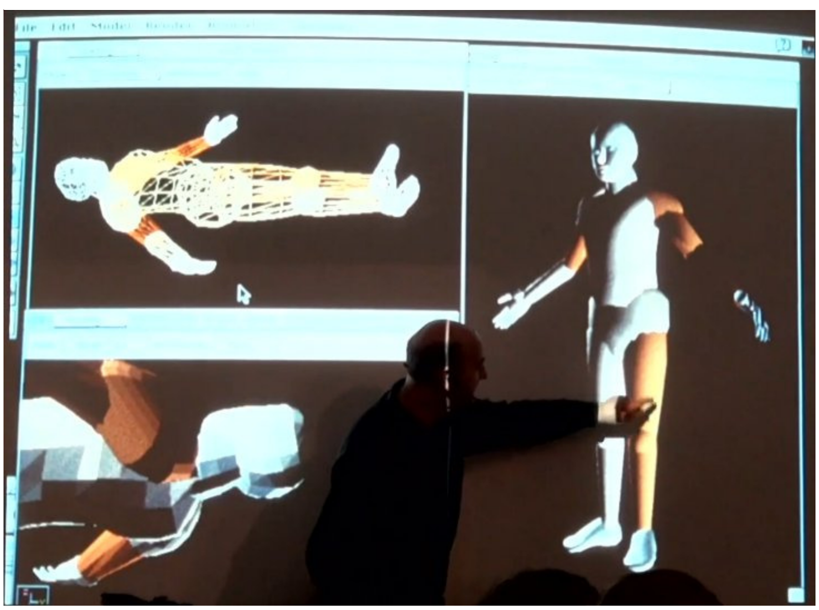


Figure 4.21 Stelarc demonstrates the touch-screen interface of *Fractal Flesh*. Aalto lecture, 2012.

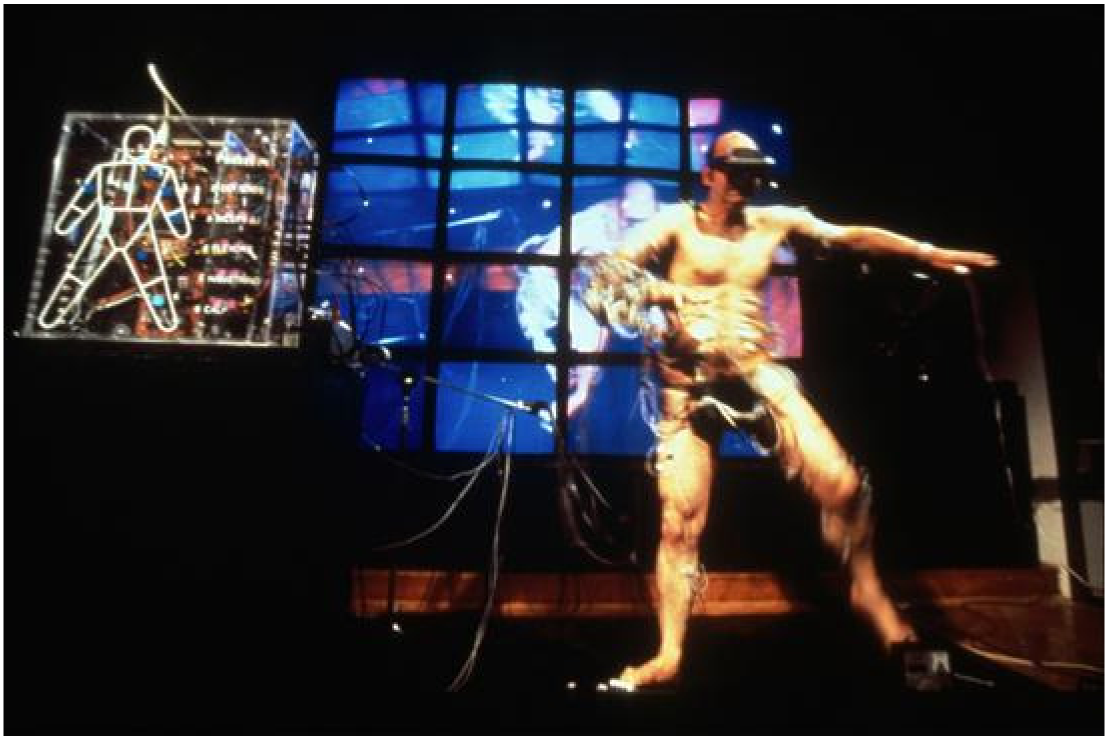


Figure 4.22 Stelarc, *Fractal Flesh*, Telepolis, 1995.

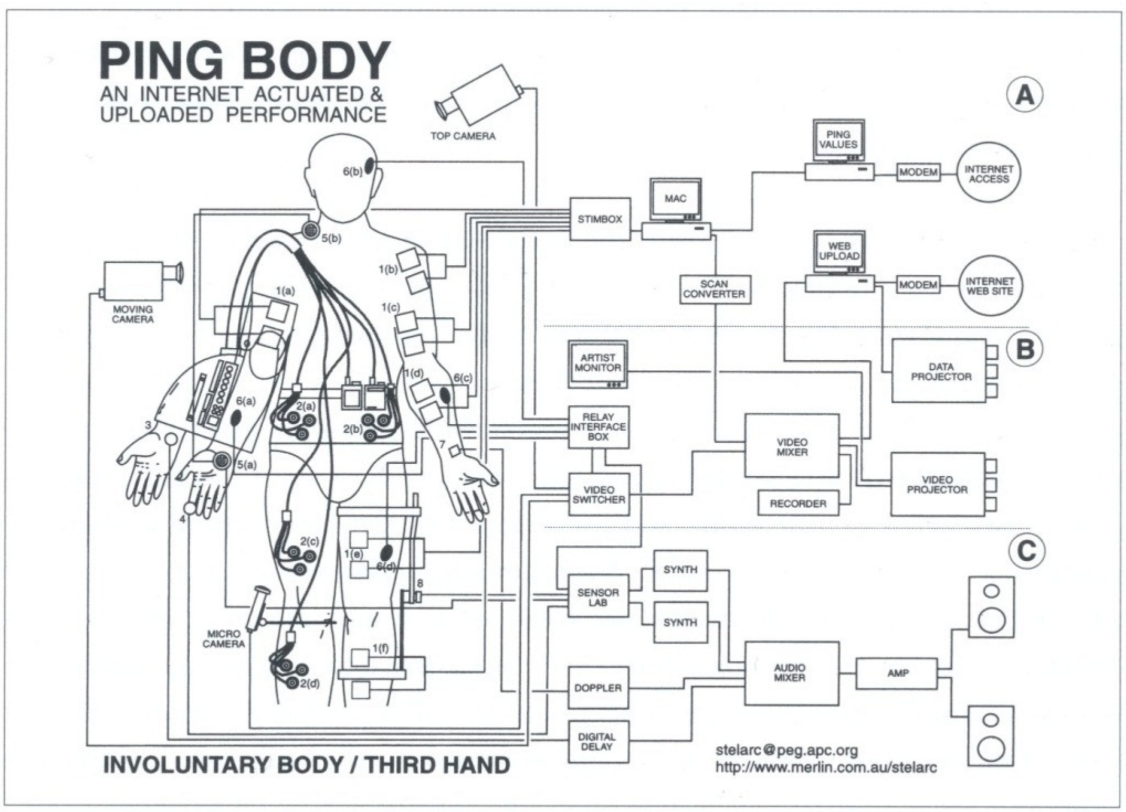


Figure 4.23 Diagrammatical illustration for *Ping Body*.

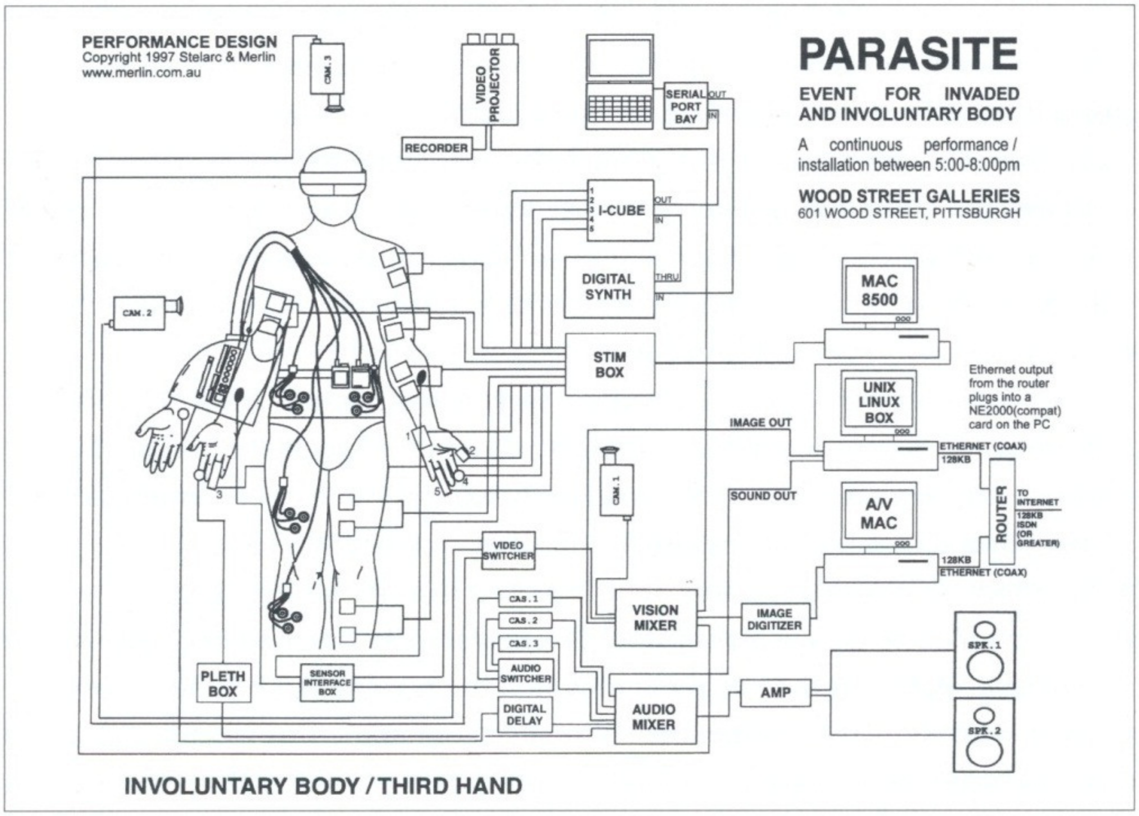


Figure 4.24 Stelarc and Merlin. *Parasite* Diagram.

Figure 4.25 The eponymous *Hackers*, 1995.

Figure 4.26 ***Stomach Sculpture*****, Fifth Australian Sculpture Triennale, NGV, Melbourne, September 11-October 24, 1993. Photo by Anthony Figallo.**

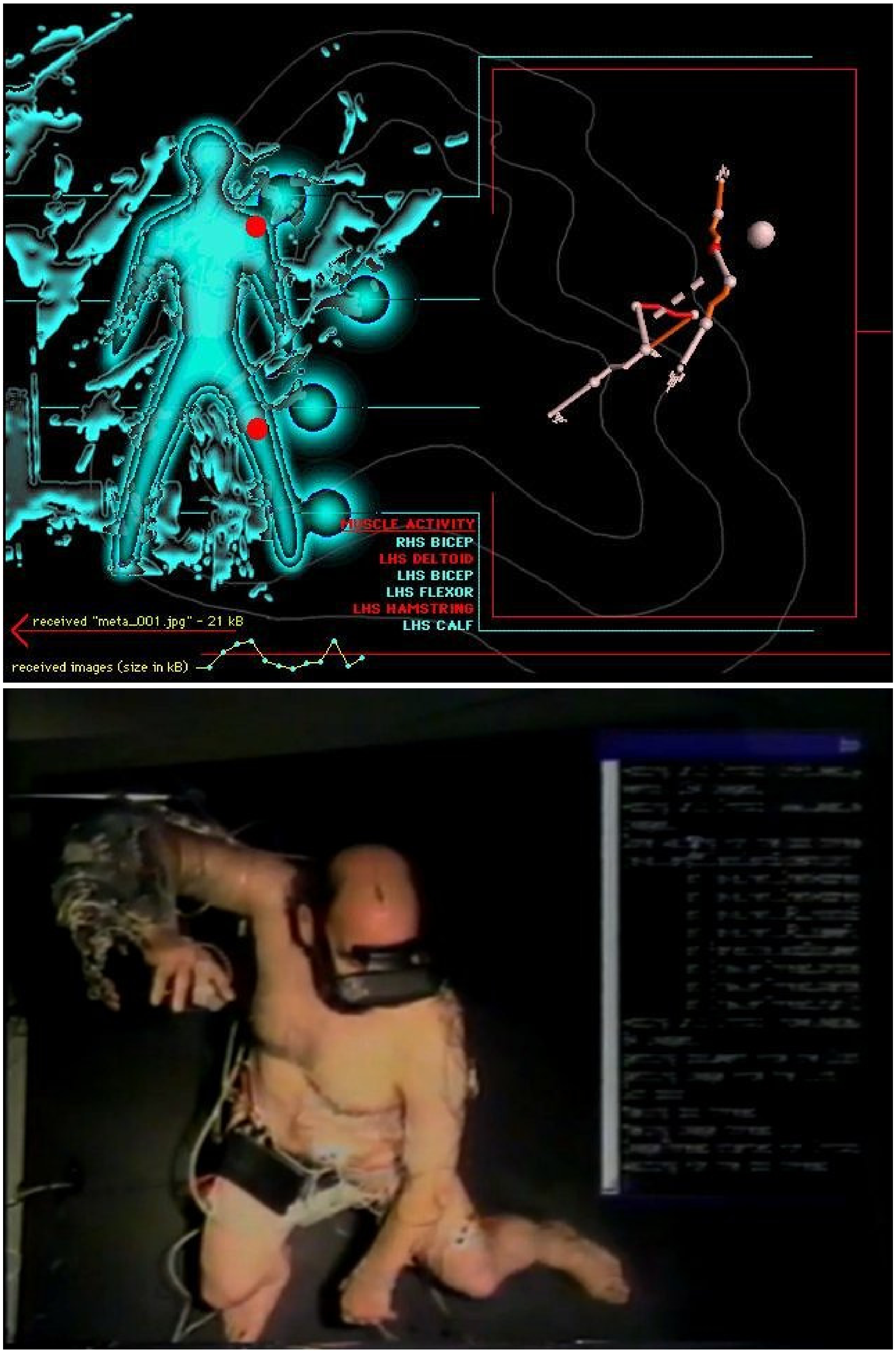


Figure 4.27 ***Parasite*****: Computer interface and Stelarc with data processing window**

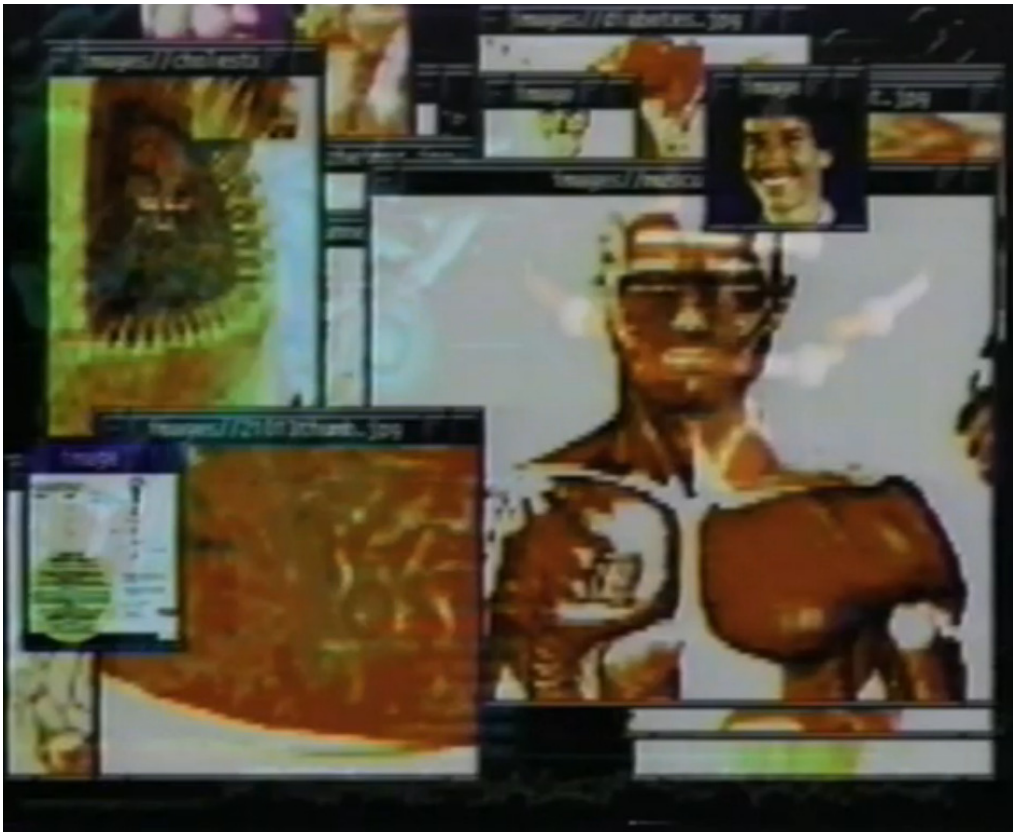


Figure 4.28 *Parasite*: windows showing image search results.

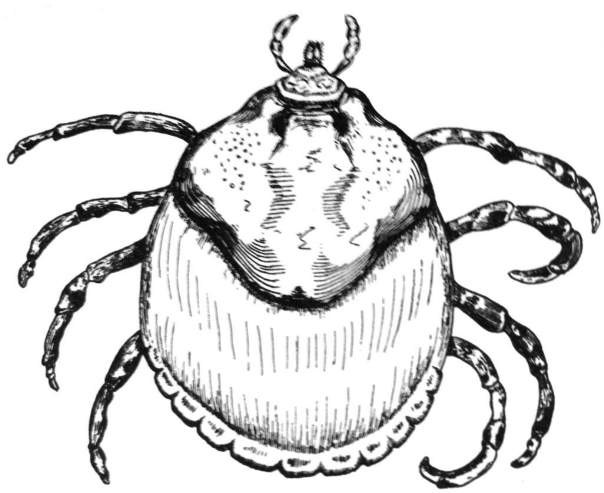


FIGURE 1. Tick

Figure 4.29 Jacob von Uexküll., "Tick," *A Foray Into the Worlds of Animals and Humans,* 1933.

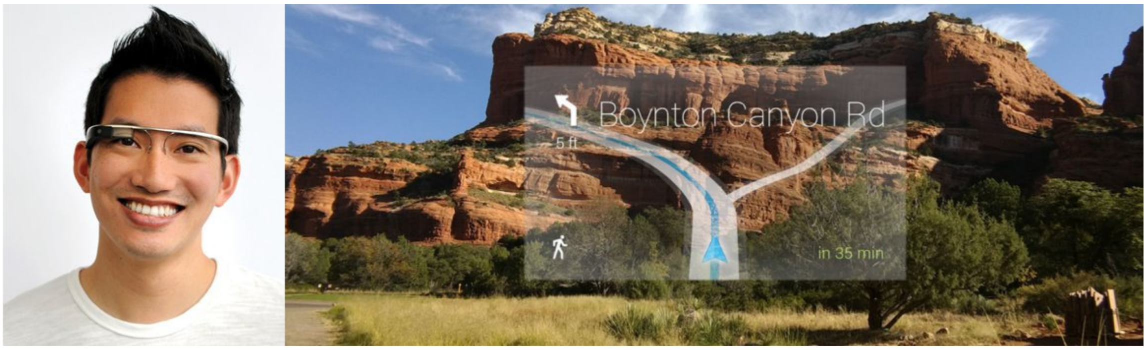


Figure 4.30 Google, Google Glass prototype and simulation of augmented reality.

"Has he lost his mind? Can he see or is he blind?" –Black Sabbath," Iron Man"[525]

Chapter 5 : Conclusion

Throughout this project, I've drawn on stories, many of them science fiction, to highlight ways in which we've imagined what it means to live in the future. These are stories that are both influenced by, and in turn influence, science as well as art. I conclude now by introducing one more story that highlights the themes I've discussed here and that allows me to summarize the claims I've made. This is 2013's blockbuster *Iron Man 3,*[526] based on the Marvel comic book character brought to the screen in the highly successful 2008 *Iron Man,* 2010 *Iron Man 2*, and 2012 *The Avengers.* The big-budget kickoff to the (increasingly early) summer film season, *Iron Man 3* is primarily shiny, silly, escapist fun. Yet, as is the case with so much science fiction, it reflects fundamental truths about how we see the world and ourselves. Set apparently in the present day (though in an alternate reality in which Stark's superhero cohort, the Avengers, has recently defeated an alien invasion), its technology is not highlighted as particularly futuristic, but blends seamlessly into familiar, present-day scenarios.

The world of *Iron Man* features a wireless communications system through which the eponymous hero can access his own computer system, personified by the AI entity Jarvis; multiple armored suits that are "coded" to his own body, flying to, and there assembling themselves on, his person on command (fig. 1); and an electro-biological virus called Extremis , capable of *re*-coding the body. In the original graphic novel, Maya Hansen, the scientist who invented it, describes Extremis as:

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[525] Geezer Butler (Vertigo, 1970).
[526] Shane Black, Director (Marvel Studios).

> a bio-electronics packaged, fitted into a few billion graphic nanotubes and suspended in a carrier fluid. A magic bullet, like the original Super-Soldier Serum—all in a single injection. It hacks the body's repair center—the part of the brain that keeps a complete blueprint of the human body. When we're injured, we refer to that area of the brain in order to heal properly. Extremis rewrites the repair center. In the first stage, the entire body essentially becomes an open wound. The normal human blueprint is being replaced with the Extremis blueprint. You see? The brain is being told that the body is wrong.527

As Robert Downey, Jr., as Tony Stark, the human behind Iron Man, glosses it in the film, "Essentially you're hacking the genetic operating system of the living organism." Perhaps needless to say, given the humanist tendencies of much of science fiction (particularly in Hollywood's hands), this tampering with the body goes horribly wrong, providing the film with a moral of sorts as well as its villain. Mad scientist Aldrich Killian injects Extremis, which his now-employee Hansen still hasn't completed, into soldiers who had lost limbs. Although they regrow the limbs, an unresolved "glitch" causes some to spontaneously combust—explosions Killian covers up by manufacturing a terrorist plot.

As its title suggests, the eponymous Iron Man is a cyborg, part man, part iron: a more-or-less ordinary (though fabulously wealthy, through Stark Industries' weapons technologies) human augmented by a highly technical, flying suit of armor. In the first film, wherein he builds his first suit in order to escape the insurgents who have taken him captive, he also fits himself with an electromagnet and arc reactor that both prevents the shrapnel embedded near his heart from killing him, and powers the suit. In the present film, Stark increases his cyborgization by injecting microcomputers into his arms, allowing him to summon and control the suit from wherever he may be at the moment.

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[527] Written by Warren Ellis, with art by Adi Granov, *The Invincible Iron Man: Extremis* (New York: Marvel, 2007), #3.

Although Stark's Iron Man suits, "cyberpathically" controlled and increasingly powerful, protect him when he wears them, he is plagued by insomnia and anxiety attacks in the wake of the aforementioned alien invasion. Nonetheless, he seeks to destroy a villain called the Mandarin, who seizes the television airwaves to take credit for the string of bombings and to promise more. Near the end of the film, Stark discovers that the Mandarin is simply a front for Killian, and is played by a clueless and hapless stoner of an actor.[528] "The second you give evil a face," Killian explains later, "you hand people a target"; he is interested in being the power behind the operation, not the face (and hence target) in front of it. Not only is the Mandarin merely a face—it's not even an original one, having been modified by plastic surgery.

Indeed, the film plays with ideas of identity and visibility throughout; at one point, Stark meets a fan with an (all but unrecognizable) tattoo of Stark on his forearm (fig. 2)—not the best likeness, the fan admits apologetically, as it was based not off a photograph, but a doll the latter made. When Stark storms what he believes to be the Mandarin's compound, it is not in his shiny metal suit, but in an insouciant hoodie sweatshirt, his weapons small grenades made from Christmas ornaments and a Tazer from a gardening glove. The U.S. government's response to the Mandarin, the "Iron Patriot" (fig. 3), in turn a rebranding of the earlier "War Machine," is essentially a bulked-up and less-colorful Iron Man suit. The suit is happily welcomed aboard Air Force One in the false belief its wearer is U.S. Colonel James Rhodes—only to prove a Trojan horse delivering a dangerous terrorist who kidnaps the president. The Iron Man suits even, at times, act on their own, without any occupant; in one early scene, Stark's

[528] Trevor Slattery, the actor who plays the Mandarin, is in turn played, in a brilliant twist, by Ben Kingsley, whose own chameleon-like looks and abilities have earned him the roles, among others, of Mohandas Gandhi, a Russian villain, and a Polish gangster.

girlfriend Pepper Potts is dismayed to discover that she has been interacting with an empty suit as a proxy for Stark, rather than the man himself.

These empty suits function in the film's obligatory climactic battle scene as essentially drones, choreographed, and occasionally worn, in turns, by Stark. He declines to give a suit to his compatriot Rhodes, explaining, "They're coded only to me," though he somehow manages to sic one on Killian and have Jarvis explode it. Thanks to Extremis, such a blow merely wounds, rather than destroys, Killian, but he is finally dispatched by the Extremis-enhanced Potts, who also wears part of one of the suits and is able to vaporize Killian with its blasters.

The battle won, Stark holds Potts tightly and promises he's getting rid of his distractions—then orders Jarvis to run "the Clean Slate Protocol." As the orchestra swells, the suits explode brightly against the dark sky, their self-destruction a beautiful fireworks display reflected in the river below. The film winds down with a montage, narrated by Stark: "sorting out" Potts' Extremis injections; undergoing surgery himself to remove the shrapnel in his chest, along with his arc reactor; visiting the blasted foundations of his house and laboratory, leveled by Killian's terrorists. "My armor was a cocoon," he intonates, "and now I'm a changed man. You can take away my house, all my tricks and toys; one thing you can't take away: I am Iron Man."

Tony Stark, qua Iron Man, is a character of fantasy: a wise-cracking, genius inventor with wealth, respect, and irresistible charm. He is just imperfect enough, with his insomnia, anxiety attacks, and occasionally malfunctioning equipment, to be (in an even greater fantasy) identifiable. Yet Stark is what his creator Stan Lee calls "a quintessential capitalist"—a munitions merchant who is so cocky when we meet him in the first *Iron*

Man film that one can't help but think that being captured by the insurgent group whom so many of his weapons have killed may in fact be only fair. His family's fortune, and his personal wealth, have come from designing and producing tools of destruction; in the first pages of the *Extremis* graphic novel, he finds he can't even look himself in the eye, let alone answer an interviewer's questions about unexploded "bomblets" left after the Gulf War, or landmines in East Timor.[529] Iron Man's continued popularity (*Iron Man 3* is, as of this writing, the ninth highest-grossing film of all time, having crossed the $1 billion global threshold within approximately three weeks of its initial release[530]) suggests that audiences do continue to identify strongly not just with Stark, but with the themes I've highlighted here: the uncertainly about who the enemy (or hero) is or what he even looks like; the inextricability of government and private industry; the pervasive and unavoidable power of capital; the possibilities and fears of nanotechnology and body modification; the extraordinary possibilities of communication and connection offered by the global network of the Internet.

Iron Man embodies Weiner's dream of cybernetics, the suit responding perfectly in direct response to not just Stark's body, but his mind. His self-surgeries, far less messy—or public—than Orlan's, allow him to interface with his suit through his own skin; in the graphic novel, a secondary skin originates at the microcomputer insertion points, tessellating into a gold "undersheath" that gives him direct physical control over the suit. His multiple suits act as replaceable skins and, indeed, lives—the former lost in the defense of the latter. He experiences not just Virtual, but Augmented Reality through his

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[529] *Extremis.*

[530] Daniel Loria, "UPDATED GLOBAL: 'Iron Man 3' Joins The $1 Billion Club, Breaks All-Time Top Ten in Global Box Office," BoxOffice.com. May 17, 2013. http://www.boxoffice.com/latest-news/2013-05-17-global-iron-man-3-shatters-the-1-billion-mark

helmet, an advanced head-up flight display that is made visible to the audience by superimposing it over Stark's features (fig. 5). Finally, the Iron suit is the epitome of the "hollow, hardened body" Stelarc claims is necessary, this one allowing for survival in the least hospitable of environments: underwater, extreme heat, and even outside earth's atmosphere. These are the characteristics that make Iron Man a superhero, even if, unlike the rest of his Avengers cohort, his superpowers are external rather than inherent (such as Captain America's enhanced strength and reflexes, or the Hulk's ability to transform into a giant green monster) (fig. 6). What allows us to consider him a posthuman one is his failings: his post-traumatic stress induced anxiety attacks (not master of his own mind, as Freud would put it); his relative helplessness when separated from Jarvis, his outsourced brain (Haraway's cyborgian wound); and his entanglement in the webs of global capital (Hardt and Negri's Empire).

Iron Man is a character both fantastical and identifiable enough to represent wish fulfillment and escapism, yet just believable enough to act as a mirror to his audience, emphasizing that we are living in this future: as yet, one free from alien invasions and limb re-growing sera, but still under their threat—or promise. "Of course, there are those people who say progress is dangerous," narrates Stark ironically as surgeons extract fragments of shrapnel from his unconscious form. In this case, "progress" represents, at least technologically, regress: just as he destroyed his Iron suits and "tinkered with" Potts' re-coded DNA or perhaps brain[531] to return her to the "normal" she craved, he now chooses to have, along with the shards threatening his heart, at least part of his own

[531] Off-screen; the audience is not privy to the changes he made, or how, let alone the physical, bodily structures that might be involved in such an endeavor.

cyborgian machinery, in the form of the arc reactor, removed—marking a return to what we can't help but read as the more "natural," and thus humanist.

Perhaps this *is* the "danger" in the "progress"; the idea that we can separate ourselves from not just our technology, but the networks that, here in the future, anchor and define us: that there is a "nature," or purity, to which we could return. Iron Man, thankfully for us, doesn't entirely embrace this ideal of the "natural"; although the final scene begins with him throwing his arc reactor into the sea, it concludes with him driving away in his Audi R8 E-tron—a cutting-edge electric sports coupé—pulling a trailer of salvaged mechanical equipment, and asserting, "I am Iron Man."

To recognize the posthuman in the hero and themes of a summer popcorn movie may indeed indicate that I've become entirely too absorbed in my research project. However, whether or not that is the case, I believe it also indicates that such themes are indeed increasingly pervading global culture, shaping how we understand ourselves, our bodies, and the technology around us. The stories we tell about ourselves, and the objects that show us to ourselves, matter. The figure of the posthuman provides a lens through which to make sense of living in the future, one that, I have argued, when understood correctly, allows us to recognize the rich entanglements that characterize our world and to appreciate the opportunities for agency and connection that it offers.

Figure 5.1 ***Iron Man 3*** **poster showing Tony Stark in front of multiple Iron Man suits.**


Figure 5.2 ***Iron Man 3*** **film still. "Tony Stark" tattoo.**

Figure 5.3 *Iron Man 3* still. The Iron Patriot suit.

Figure 5.4 *The Invincible Iron Man: Extremis.* "Tony, what have you done?" "This. Supercompressed and stored in the hollows of my bones, Maya. I carry the crucial undersheath of the Iron Man suit inside my body now."

Figure 5.5 ***Iron Man 3*** **still. Augmented Reality inside the Iron Man suit.**

Figure 5.6 Poster for ***The Avengers*** **(Marvel, 2012)**

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