CHAPTER FIVE
The Virtual Body in Cyberspace

This chapter speculates about the body on the electronic frontier. In one sense, this frontier is an *imaginary* construction that identifies a horizon of contemporary cultural thought. But in another sense it is a real space on the fringe of mainstream culture: the "electronic frontier" names the space of information exchange that already exists in the flow of databases, telephone and fiber-optic networks, computer memory, and other parts of electronic networking services.[1] The frontier metaphor suggests the possibility of a vast, unexplored territory. Computer enthusiasts, also known as hackers, populate frontier villages; advance scouts/pilgrims include the by now infamous computer viruses, worms, and Trojan horses that were designed very simply to "map" the network into which they were released. In elaborating the Western frontier metaphor, John Perry Barlow explains that in the new small towns, "Main Street is a central minicomputer.... Town Meetings are continuous and discussions range on everything from sexual kinks to depreciation schedules. "[2]

In a more material sense, the electronic frontier includes workstations, file servers, networks, and bulletin boards, as well as the code of application programs, information services such as Prodigy and CompuServe, and online databases.[3] This frontier functions as the infrastructure of the computer/information industry and, as such, structures the further development and dissemination of computer technologies and services. One of the most publicized computer applications of the last decade has been the construction of "virtual environments," now more widely known as "virtual reality."[4] Since 1987, virtual reality (VR) has further evolved into an industry in itself; it is also at the heart of an emergent (sub)culture that includes computer-generated realities, science fiction, fictional sciences, and powerfully evocative new visualization technol-

ogies.[5] My guiding question for this chapter concerns the role of the body in this formation.

To set the stage for a discussion of the body in cyberspace, I offer a reading of the cultural aspects of the virtual reality industry, including its embodiment in a cyberpunk subculture, its media spectacles, and commodities-on-offer. Reporting on a trip through cyberspace, I wonder how the repression of the body is accomplished so easily and about the consequences of this disembodiment. I conclude by posing several questions about the biopolitics of virtual reality.

Marketing Cyberspace

Virtual technologies use graphics programs to create a three-dimensional, computer-generated space that a user/participant interacts with and manipulates via wired peripherals. In contemporary science fiction, the 3-D, computer-generated space or virtual environment is referred to as "cyberspace," a term first used by William Gibson in his cyberpunk novel *Neuromancer* and now gaining acceptance among VR technicians to name the interior space of virtual reality programs.[6] In its fictional form, cyberspace is sometimes referred to as the matrix or "the Net," a shorthand name for the network constructed by the connections between fixed computer consoles and portable computer decks.[7] In cyberpunk novels, "real" geographic urban-suburban space is referred to as "the sprawl," and although hackers often have to hide out or navigate their way through it, the real "action" always occurs in the structured informational space of the matrix.

In its commercial form, cyberspace describes an electronic matrix or virtual environment. It is also listed as a trademark of Autodesk, one of the two better known companies that develop software tools for virtual realities. Standard cyberspace hardware includes a set of wired goggles that track head movement connected to a computer that runs VR software. In 1985, a computer musician named Jaron Lanier founded a company called VPL that prides itself on being a "pioneer in Virtual Reality (VR) and visual programming." Better known than his company's products, Lanier has become a cult figure in the virtual reality subculture, whose members include technological innovators, popular cultural icons, game designers, and computer entrepreneurs. Lanier is often quoted as saying "whatever the physical world has, virtual reality has as well."[8]

Mondo 2000, the preeminent hacker magazine of the 1990s, offers a

Figure 23. Cover of *Mondo 2000* (vol. 3, Winter 1991), featuring Debbie Harry.

glimpse into the subculture formed in and around the fictional world of cyberspace (figure 23). Posing is certainly nothing new to popular subcultures, and indeed, this is part of Mondo's attraction for mainstream readers: it lets us in to the in-crowd. Three features stand out: its glossy, visually dense, techno-art layout; the regularly scheduled iconoclastic reports from the electronic frontier; and mediated interviews with the high priests of street tech, notably William S. Burroughs and Timothy Leary. It also promotes up-and-coming visionaries such as Lanier and John Perry Barlow, as well as other cultural cybercritics (such as Kathy Acker, Avital Ronell, and Ted Nelson) and various rock groups, performance artists, smart drug advocates, and electronic industry movers and shakers. In short, Mondo 2000 publicizes the key features of the new subculture: "founding fathers," mythic narratives of identity, a specialized language, and a lot of new technology. In doing so, *Mondo 2000*, house organ for the cyberpunk industry, popularizes the worldview of those addicted to the possibilities of life in the microworld.

Topically, *Mondo 2000* picks up where McLuhan's Mechanical Bride left off, without the rhetorical questions and, for the most part, without the cultural criticism.[9] Where McLuhan fixated on magazine advertisements that hinted at the ominous fusion of sex and technology, *Mondo 2000* became the magazine to celebrate the fusion of sex and technology in its

1960s. In part this reflects the widespread 1990s nostalgia for 1960s fashions and fads; thus, an issue of Mondo might include retro-topics such as "on the road" stories, drug synthesis instructions, mod fashion icons, and reports from the underground. The difference is that in the 1990s the drugs are intended to make us "smart," hallucinogens are replaced with hallucinogenres, the "Underground" is a band, and the best sex is virtual.[10] In a review of a show curated by Shalom Gorewitz, the *Village Voice* called the cyberspace artists and hackers "gonzo techno-hippies."[11] Indeed, the juxtaposition of countercultural rhetoric with technological elitism constructs an interesting stage for the promotion of virtual reality technologies. *Mondo 2000* makes no pretense of democracy and no attempt at accessibility, advising readers that unsolicited manuscripts are burned at the full moon and that "unsolicited art work will be electronically scanned and altered and appear uncredited in other magazines." Advertisements plug in-group products: Gibson and Sterling's new novel, reprints of Leary's work, Avital Ronell's *Telephone Book*. But the pleasure of recognition is high. Articles demonstrate the appropriate attitude to the "New World DisOrder" while they show you who/what you need to know/read/buy to be a member by imitation only. Even though electronically connected cyberpunks are dispersed from coast to coast, it's pretty obvious, according to *Mondo*, that the happening place to be is on the West Coast. So even though the real story about the development of virtual reality technologies takes shape all over the U.S. - and especially in Britain, Australia, and Italy (among other places) -in keeping with the frontier logic, the best (mythical) cyberspace events have all taken place in our own American wild, wild West.

Of course, the virtual reality industry includes much more than the subculture visualized by *Mondo 2000*. On the PR front, it includes conferences staged like media events -such as "Cyber Arts International," billed as "the world forum for emerging technologies in the arts, entertainment and education," and "Cyberthon" a multimedia virtual reality fair sponsored by the Whole Earth Institute.[12] Richard Kadrey describes the technology-saturated 24 hours of Cyberthon No. 1: "On October 6 and 7 [1990] ... the Whole Earth Institute turned the sound stage of San Francisco's Colossal Pictures into the world's biggest virtual-reality fair. Almost four hundred people got the chance to see and experience a whole range of reality-bending technologies close up. Over three hundred lucky lottery winners got the chance to don goggles and gloves and actually enter virtual worlds created by teams from Autodesk, Sense8, and Jaron

Lanier's VPL."[13] Ironically, the conference announcements advertised in *Mondo* or disseminated through electronic bulletin boards often rely on a rhetoric of "reality" to attract conference participants.[14] For example, they offer to make available - for a price, of course - "real" VR programs and equipment. Registration for the 1991 CyberArts International cost $450 and allowed a participant to visit special exhibits such as the CyberArt Gallery and "Product Expo," where one could "experience" VR *live* by taking part in interactive music performances (where the audience directs the music) or by trying a *"live* exercise in producing integrated media. " Cyberpunk night at CyberArt, sponsored by *Mondo 2000*, promised "an evening of elegant entertainment and high tech hallucinations," complete with master of ceremonies Timothy Leary and a "new kind of theatrical entertainment *experience*." The exhortations to "experience it live" - the shows and the software systems on display - suggest more than an ironic subtext to the supermediated VR spectacles. They also draw our attention to the process whereby VR technologies are transformed into commodities, through the engagement between people and products.

For all the media hype, audience response to VR suggests that, at best, it is at the "Kitty Hawk" stage - more PR than VR, as one discussion list participant wrote. "Serious" VR research is another matter, though. It has been reported that some computer scientists do not like the term "virtual reality," originally coined by Jaron Lanier, the VPL maverick. "The term 'virtual environment' better fits a field of scientific research," claims a professor of computer graphics quoted in a 1991 *Chronicle of Higher Education* article. "Virtual reality is an unattainable goal, like artificial intelligence."[15]

Although no official history of VR has been drafted, computer science and computer graphics are its foundation; it draws on Norbert Wiener's work in the 1940s on the science of cybernetics as well as on the early history of calculating machinery.[16] Other historical contributions include research during the 1960s on two-dimensional and three-dimensional viewing, and work from the 1970s on "visually-coupled" systems. During the 1980s, VR-related research proliferated in the areas of interface design, telerobotics, optical sensors, simulation parameters, and image processing and display. Myron Krueger, sometimes referred to as the father of artificial reality, wrote a very interesting but brief essay on the history of the field, in which he explains that although it took awhile for "the notion of artificial reality to take hold" -due to some common constraints on

technological research (few journals and scarce funding for new technologies) and several cultural constraints (such as Senator William Proxmire's Golden Fleece awards and geographical displacement) - "interactive computing is now the norm."[17] Implicitly he suggests that the biggest constraint inhibiting VR research was the lack of appreciation for its possible wide-scale market applications. Other than NASA's interest in head-mounted displays for reconnaissance and weapon delivery, no one had imagined the consumer market possibilities of human-machine interactive systems.

The scene has changed by the mid-1990s. Virtual reality applications in telecommunications, surgical simulation, and computer-aided design are of great interest to current industry planners. In the electronics industry, VR is touted as an attractive, albeit capital-intensive, business venue; it demands the development of a host of new products, including biotechnical apparatuses such as datagloves, wired bodysuits, head-mounted tracking devices, goggles, headphones, miniaturized LCD screens, and digitizing cameras.[18] These devices and programs are incredibly expensive, not only to develop, but also to purchase. A cyberspace system marketed by VPL, called "A Reality Built for Two" or RB2, retailed for $150,000 in 1991; it comes with two headsets, two sets of DataGloves, and a powerful minicomputer. One of the main purposes of the splashy VR demonstrations and conventions is to create investment interest as well as a market for VR applications. Members of the cyberpunk subculture-who are also the programmers, designers,and techniciansseem to take for granted the economic imperative to create a market for their products. In his description of the design of a cyberspace playhouse for sports and fitness, Randal Walser, then manager of the Autodesk Cyberspace Project, explains:

> The critical thing to realize about the design of cyberspaces for sports, is that sporting decks will generally have sophisticated props, like recombinant bicycles and inclined treadmills, and that sporting houses will make money by renting time on those decks. The purpose of a cyberspace for sports is not just to help people have fun and stay fit. It is also to help keep sporting houses in business, by keeping their decks full of players.[19]

Other industry futurists envision large-scale VR installations primarily for entertainment and leisure services and would love to attract the backing of Disney or Universal -who have theme parks that currently use

robotics -to invest in the development of "Dream Parks" that are based on "interactive role-playing environments."[20] These speculations about the future of VR contribute to a "bottom-line" message about its potential: there is a lot of money to be made in the development and marketing of cyberspace.

In summary, the key features of this new subculture include popular cultural artifacts (e.g., *Mondo 2000* and the films *Lawnmower Man* and *Johnny Mnemonic),* a mythic set of founding fathers (Ted Nelson, Jaron Lanier), a specialized language that draws on the science of computer technology and computer programming, and the promise of new hightech commodities. Oddly, at the same time that it promotes the sexiness of new technology and is unabashedly elitist, it also evokes a countercultural belief in the possibility of resistance within a corporate culture. Such juxtapositions - of technology and the counterculture, of "reality effects" and real demonstrations, of the science and the PR-suggest that cyberpunk subculture is actively engaged in the work of processing cultural meanings. As it plays itself out, the future of virtual reality is intimately tied to the capitalist structure of the information technology industry. Now that various cultural visionaries have turned their attention to the work of imagining the future of VR, they ensure that it will be fully articulated to a commodity structure. The staged subcultural events draw our attention to the process whereby technologies are transformed into technological commodities.

As "countercultural" as members of this subculture want to be, the virtual reality industry actually disseminates a certain mythology and a set of metaphors and concepts that cannot help but reproduce the anxieties and preoccupations of contemporary culture. As Jack Zipes claims, "the inevitable outcome of most mass-mediated fairy tales is a happy reconfirmation of the system which produces them."[21] More than once, the popular press have commented that simulated experiences "offer opportunities for safe activity in a risky world." Called "electronic LSD," or an "electronic out-of-body experience," VR in its celebrated media form seems little more than an escape from conventional reality, a way out for those who confront the severe limitations reality imposes in the form of corporate ideology, determining social structures, and the physical body itself.[22] A more traditional ideological critique of the VR industry probably would begin by elaborating its participation in postindustrial capitalist modes of production and would go on to expose the way that the "oppositional" subculture actually promotes bourgeois notions such as creative genius,

hyperindividualism, and transcendent subjectivity. In his essay "Hacking Away at the Counterculture," Andrew Ross elaborates how the story "told by the critical left about new cultural technologies is that of monolithic5 panoptical social control, effortlessly achieved through a smooth, endlessly interlocking system of networks of surveillance." But, as he goes on to write, this "is not always the best story to tell. "[23]

I agree that this ideological critique may be too totalizing. When discussing new technologies, it is important to try to avoid the trap of technological determinism that argues that these technologies necessarily and unilaterally expand the hegemonic control by a techno-elite. Technologies have *limited* agency. Having said that though, it does appear that virtual reality technologies are implicated in the production of a certain set of cultural narratives that reproduce dominant relations of power. Perhaps a better approach for evaluating the meaning of these new technologies is to try to elaborate the ways in which such technologies and, more importantly, the *use* of such technologies, are determined by broader social and cultural forces.

One of the most often-repeated claims about virtual reality is that it provides the technological means to construct personal realities free from the determination of body-based ("real") identities. Whereas VR promoters have focused primarily on the subjective and expressive dimensions of VR in public relations campaigns for VR games, users are also told that the physical body is of no consequence in virtual worlds. Even though some games may soon allow players to design personal avatars or puppets -simulations of oneself - more frequently VR is promoted as a body-free environment, a place of escape from the corporeal embodiment of gender and race. Upon analyzing the "lived" experience of virtual reality, I discovered that this *conceptual* denial of the body is accomplished through the *material* repression of the physical body. The phenomenological experience of cyberspace depends upon and in fact requires the willful repression of the material body. In saying this, I am implicitly arguing that we need to extend the ideological critique of virtual reality technologies. From a feminist perspective it is clear that the repression of the material body belies a gender bias in the supposedly disembodied (and gender-free) world of virtual reality. In arguing that this repression is a technological phenomenon, I am not claiming that it is entirely determined by the technology. On the contrary, I will elaborate how VR technologies articulate cultural narratives about the techno-body so that these technologies have the effect of naturalizing a gendered body phenomenon.

A Trip through Cyberspace

In contrast to a 2-D database, VR applications allow users to interact with three-dimensional representations of information. So instead of searching a database for lexical indicators or parts of computer code, a VR patron can interact with a data storage environment and browse through information that is represented graphically. According to one article in *Industry Week*, with VR "you can imagine CAD models that, in effect, come alive.... You can enter them. You can make them any scale. They could be models of molecules, for example, and you could move about within these molecules with your whole body to examine their structures."[24] In this way, the cyberspacial matrix serves as an abstract environment within which computer patrons can navigate.

All VR systems involve the interface of the body and technology in the use of some kind of bio-apparatus; three of the more common ones are the Nintendo PowerGlove; a headmount that includes LCD screens; and a "hotsuit," which is a set of wired overalls.[25] Although my first trip through VR (with goggles and a track ball) was uneventful, I noticed the ease with which I made sense of the scene projected on small lenses mounted in the front of my helmet. The vision projected onto the small LCD screens was colored like a cartoon world, with yellow walls, orange floors, and brown tables. The point of contact with the interior spaces of VR - the way that this scene makes sense - is through an eye-level perspective that shifts as the user/patron turns her head; the changes in the scene projected on the small screens corresponds roughly with the real-time perspectival changes one would expect as one normally turns the head. Although other VR users have reported a noticeable time lag in the change of scene as the head turns, I notice no significant lag. The timing of the change of scene corresponded quite closely with the changes I would "normally" expect as I turn my head. The most disconcerting effect of my trip through VR was the inability to "right" my perspective after I would awkwardly move my "point of view" through the scene. Because the scenes still look like computer animations, there are few visual cues to use as markers of the rightside-up of the scene. Furthermore, in the program I used there is no gravity and therefore no way to orient oneself in the scene using the body as a kinesthetic point of reference.

In most VR programs, a user experiences VR through a disembodied gaze - a floating, moving "perspective" - that mimes the movement of a disembodied camera "eye." This is a familiar aspect of what may be called

a filmic phenomenology, where the camera simulates the movement of perspective that rarely includes a self-referential visual inspection of the body as the vehicle of that perspective. The disembodiment of the eye is accomplished through the manipulation of the camera to approximate the height and angle of the point of view of an eye; the body of that eye is repressed, in that it is rarely shown (revealed) and never felt. The naturalization of the filmic gaze is one of the foundational planks of psychoanalytic film criticism and certainly not a new discovery. But what is of interest to me in my encounter with virtual reality is the way that the repression of the body is technologically naturalized. I think this happens because we have internalized the technological gaze to such an extent that "perspective" is a naturalized organizing locus of sense knowledge. As a consequence, the body, as a sense apparatus, is nothing more than excess baggage for the cyberspace traveler.

The Biopolitics of Virtual Bodies

What is becoming increasingly clear in encounters with virtual reality applications is that visualization technologies no longer simply mimic or *represent* reality - they virtually recreate it. But the difference between the reality constructed in VR worlds and the reality constructed in the everyday world is a matter of epistemology, not ontology.[26] They are both cultural as well as technological constructions, fully saturated by the media and other forms of everyday technologies. With respect to VR, it no longer makes sense to ask whose reality/perspective is represented in the various VR worlds, the industry, or the subculture; rather we should ask what reality is *created* therein, and how this reality *articulates relationships* between technologies, bodies, and cultural narratives. Where the first line of questioning assumes that "perspective" and "point of view" are the main channels of knowledge, the second line of questioning asserts that there is no singular reality to virtual reality, and that the "realities" constructed therein embody the desires of those who program them.[27]

Another critical framework, one informed by feminist epistemology, asks a slightly different set of questions about the realities of cyberspace; given this formation of an industry and now a subculture based on the use of virtual technologies, what are the biopolitics of virtual bodies in cyberspace? Which is to say, how do virtual reality technologies engage socially and culturally marked bodies? This set of questions begins with the material body and opens onto institutional and social issues. What is the rela-

tion of the material body to the "sensory" simulation provided by virtual technologies? What are the phenomenological dimensions of the technologically mediated body?[28] Does VR transform body-based subjectivities? How do various interfaces negotiate the split between the material body of the user and the locus of perception that either free-floats in a virtual world or is connected in some fashion to a virtual puppet? Demographically, what kinds of bodies reside in cyberspace: humanoid? More specifically, how is the disembodied technological gaze marked by the signs or logic of gender and race? What kind of "reality surplus" is produced? When virtual "realities" are bought and sold, who will profit? What kinds of bodies are cybernetically employed in the production of computer components? At one level, VR enables the willing suspension of disbelief whereby a participant adjusts the way that sensory information is processed; certain senses are realigned (vision without gravity) to process the simulated experience, while other registers of reality are repressed. The fact that a floating point of view is intelligible attests to the flexibility of embodied sense organs. So although the body may disappear representationally in virtual worlds - indeed, we may go to great lengths to repress it and erase its referential traces -it does not disappear materially in the interface with the VR apparatus or, for that matter, in the phenomenological frame of the user.

In VR discourse, where knowledge is operationalized as "data interconnectedness," there is little consensus on the main problematic of virtual reality, let alone on the particulars of a cultural critique of it. For Michael Spring, the major conceptual problem is developing a robust model to visualize data interconnectedness.[29] Virtual reality researchers, in reflecting on its significance, struggle to articulate an adequate understanding of the process of reality construction; almost intuitively, they understand the necessity of specifying the relationship between visual representations and meaning, but they often fall back on mechanistic models of the process of communication.[30] In delineating the difference between film and cyberspace, for example, Randal Walser writes: "whereas film depicts a reality to an audience, cyberspace grants a virtual body and a role, to everyone in the audience."[31] In this account Walser offers an extremely simplistic understanding of the relationships among film, representation, and the viewing situation. Although this is gradually changing as artists become involved in the design of virtual worlds, virtual reality applications for the most part show little understanding of the dynamics of visual representation, let alone spectatorship, subjectivity, or phenome-

nological embodiment. In the end, though, as Jaron Lanier reminds us, "whatever the physical world has, virtual reality has as well." So the question emerges, what exactly does it offer?

In short, what these VR encounters really provide is an illusion of control over reality, nature, and especially over the unruly, genderand race-marked, essentially mortal body. It is not a coincidence that VR emerges in the 1980s, during a decade when the body is understood to be increasingly vulnerable (literally, as well as discursively) to infection as well as to gender, race, ethnicity, and ability critiques. With virtual reality we are offered the vision of a body-free universe. Despite the rhetorical disclaimers that this was *not* a Nintendo war, media coverage of the Persian Gulf spectacle provided numerous examples of the deployment of a disembodied technological gaze; the bomb's-eye view was perhaps the most fascinating and therefore most disturbing example of the seductive power of a disembodied gaze to mask the violence of reality.[32] The critical point here is that these new technological applications - VR, Nintendo, or bomb-cam - do not create disembodied citizens. Rather, they are themselves consequences of social changes already in place. If "the frontier" functions as a metaphor to describe the social and economic context for the development of new computer/information technologies, "cyberspace" functions metaphorically to describe the space of the disembodied "social" in a hypertechnological informational society. Cyberspace - as a popular cultural construct - shows us what can happen when popular culture "talks back" to cultural theory (to borrow a phrase from Fred Pfeil); cyberspace offers a way to think about the location of the social in postindustrial capitalism. Although this space is structured, it is impossible to map; there is no Archimedian point from which to construct a totalizing vision of the scene. At best you can wander through it, reading/writing as you walk, and maybe stumble upon something that was not programmed for you. Rich in information, if you know what you are looking for, the experience of cyberspace is always conjunctural: an effect of intersecting practices - economic, technological, bodily, political, and cultural.

In her *Esquire* article on virtual reality, Sallie Tisdale notes a "curious absence of narrative at Cyberthon, both in and out of the virtual worlds. It was an absence of plot -there is no story yet, no Cosmology."[33] In part, this is true; virtual reality promoters are computer scientists and system hackers, not cultural critics, and, for the most part, they recognize this fact -which in part accounts for their willingness, and indeed, enthusi-

asm to engage the work of artists and other cultural visionaries. On the other hand, these new technologies are implicated in the reproduction of at least one very traditional cultural narrative: the possibility of transcendence, whereby the physical body and its social meanings can be technologically neutralized. If the applications that utilize a disembodied gaze as the locus of perspective do away with the body altogether, the applications that include a representation of the body project a utopian desire for control over the form of personal embodiment. The promises of VR-connected bodies are described by Scott Fisher in his article "Virtual Environments":

> The two users will participate and interact in a shared virtual environment but each will view it from their relative, spatially disparate viewpoint. The objective is to provide a collaborative worldspace in which remotely located participants can virtually interact with some of the nuances of face-to-face meetings while also having access to their personal dataspace facilities.... With full-body tracking capability, it will also be possible for each user to be represented in this space by his or her own life-size virtual representation in any chosen form - a kind of electronic persona.... these virtual forms might range from fantasy figures to inanimate objects or from different figures to different people.[34]

In the speculative discourse of VR, we are promised whatever body we want, which doesn't say anything about the body that I already have and the economy of meanings I already embody. What forms of embodiment would people choose if they could design their virtual bodies without the pain or cost of physical restructuring? If we look to those who are already participating in body reconstruction programs - for instance, cosmetic surgery and bodybuilding -we would find that their reconstructed bodies display very traditional gender and race markers of beauty, strength, and sexuality. There is plenty of evidence to suggest that a reconstructed body does not guarantee a reconstructed cultural identity. Nor does "freedom from a body," imply that people will exercise the "freedom to be" any other kind of body than the one they already enjoy or desire.

Fictional accounts of cyberspace play out the fantasy of casting off the body as an obsolete piece of meat, but, not surprisingly, these fictions do not eradicate body-based systems of differentiation and domination. In fact, Fred Pfeil demonstrates "several ways in which much of the new SF

written by men, for all the boundary erosions and breakdowns it dramatizes, remains stuck in a masculinist frame."[35] In the course of Gibson's *Neuromancer* trilogy, for example, not only is the hero's body eventually reconstructed from fragments of skin, so is his macho-male identity. It is true that in cyberpunk narratives individual male and female bodies may be coded slightly differently than they are in prevailing cultural norms. For example, Gibson's main female character in *Neuromancer,* Molly, has been technologically modified with implanted weaponry that on the one hand makes her a powerful embodiment of female identity, no longer constrained by norms of passivity and proper femininity. On the other hand, Molly's body implants more fully literalize the characteristically threatening nature of her female body. Early in his adventures, Gibson's hero, Case, must negotiate a cyberspace invasion where he is plugged in to Molly's body. Molly gets a rider, and Case gets to find out "just how tight those jeans really are" (53).

> Then he keyed the new switch. The abrupt jolt into other flesh.... For a few minutes he fought helplessly to control her body. Then he willed himself into passivity, became the passenger behind her eyes.... Her body language was disorienting, her style foreign. She seemed continually on the verge of colliding with someone, but people melted out of her way, stepped sideways, made room. (56)

Once "inside" Molly, Case finds the "passivity of the situation irritating." This passivity refers to his lack of control over Molly's body, so in a sense Case does experience, with the help of VR technology, a bodily state more traditionally feminine. But his simstim "experience" makes no lasting impression. Nor does it provide the occasion for the development of some insight into the politics of gendered bodies. His passivity is easily sexualized. To tease him, Molly reaches into her jacket, "a finger circling a nipple under warm silk. The sensation made [Case] catch his breath" (56). This cybernetic penetration, we discover, follows a sexual encounter between Case and Molly when he recalls "their mutual grunt of unity when he'd entered her" (56). Inside of cyberspace, or out, the relations between these cybernetically connected bodies often recreate traditional heterosexual gender identities.[36]

Probably no collection so effectively betrays the masculinist values of the new cyberpunk writers as the science fiction anthology titled *Semiotext(e) SE* In their attempt to "jolt" the commercial SF publishing industry, guest editors Rudy Rucker and Peter Lamborn Wilson invited contri-

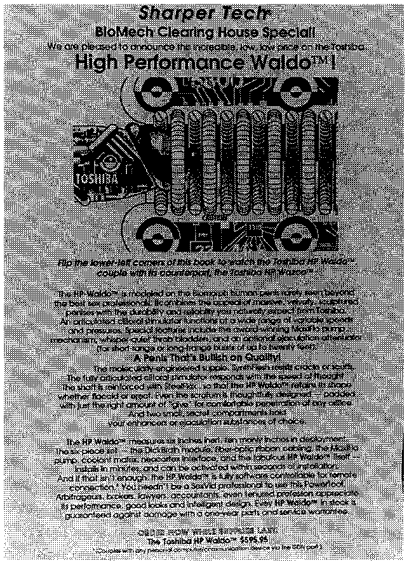

Figure 24. Description of the "High Performance Waldo." From *Semiotext(e) SF* (New York: Autonomedia, 1989), p.15. Figure 25. Cover of *bOING bOING* (no. 10: special issue, "Sex Candy for Happy Mutants!").

butions that had been rejected by other, more mainstream magazines. As they explained, "we hoped to tap a deep and almost-inarticulate groundswell of resentment against the ever-increasing stodginess, neoconservatism, big-bucks mania and wretched taste of most SF publishers"(12).[37] Although they clearly collected a range of formerly rejected material, they also produced a volume that loudly announces the gender conservatism of cyberpunk writers. Penetrating penises figure prominently on every page in the form of a flip-book illustration of the "High Performance Waldo" (figure 24), a penis that is modeled on "the Biomorph human penis rarely seen beyond the best sex professionals" (15). Indeed, the sexualization of the female body is a common theme in the various cyberpunk short stories. On this point, Andrew Ross argues that cyberpunk fiction offers the "most fully delineated urban fantasies of white male folklore."[38] In saying this, he also describes the logic behind the techno-fantasies embodied in VR applications where chic French women are made available as flirting partners to help you, the ideal male audience member, perfect your French language skills. In contemporary cyberpunk narratives, as in VR applications, cyberspace heroes are usually men, whose racial identity, although

rarely described explicitly, is contextually white. Cyberspace playmates are usually beautiful, sexualized, albeit sometimes violently powerful women (figure 25). Cyberspace offers white men an enticing retreat from the burdens of their *cultural* identities. In this sense, it is apparent that although cyberspace seems to represent a territory free from the burdens of history, it will, in effect, serve as another site for the technological and no less conventional inscription of the gendered, race-marked body. So despite the fact that VR technologies offer a new stage for the construction and performance of body-based identities, it is likely that old identities will continue to be more comfortable, and thus more frequently reproduced.

The Rearticulation of Old Identities to New Technologies

The virtual body is neither simply a surface upon which are written the dominant narratives of Western culture, nor a *representation* of cultural ideals of beauty or of sexual desire. It has been transformed into the very medium of cultural expression itself, manipulated, digitalized, and technologically constructed in virtual environments. Enhanced visualization technologies make it difficult to continue to think about the material body as a bounded entity, or to continue to distinguish its inside from its outside, its surface from its depth, its aura from its projection. As the virtual body is deployed as a medium of information and of encryption, the structural integrity of the material body as a bounded physical object is technologically deconstructed. If we think of the body not as a product, but rather as a process - and embodiment as an effect - we can begin to ask questions about how the body is staged differently in different realities. Virtual environments offer a new arena for the staging of the body -what dramas will be played out in these virtual worlds?

Even though the fetishistic nature of such technological devices (especially of the splashy demo tapes) fuels the fantasies of VR technicians (for ultimate world control), the possibilities for realizing these fantasies are probably determined more by the socioeconomic context of corporate sponsorship than by the libidinal promise of virtually safe sex -which is to say that VR research and development cannot continue without commercial investment. But this isn't the whole story. Interspersed throughout the pages of *Mondo 2000* and conference announcements, a tension of sorts emerges in the attempt to discursively negotiate a corporate com-

modity system while upholding oppositional notions of countercultural iconoclasm, individual genius, and artistic creativity. The result is the formation of a postmodern schizo-culture that is unselfconsciously elitist and often disingenuous in offering its hacker's version of the American Dream.

As Donna Haraway argues, we must be able to get beyond the rhetoric produced by both the techno-advocates and the cultural critics, because both of them inadvertently construct a demonology of technology. The issues we need to investigate concern the way that VR technologies produce simultaneous effects that are not easily judged to be "good" or "bad," or moral or immoral. For example, virtual reality applications, in an ideal form, involve a network of individual-machine interfaces located at remote outposts. In this sense, VR promotes both technological access and decentralization. But then, does it promote the further instrumental rationalization of everyday life or a new epistemological pluralism? Even as VR technology promises a new form of intersubjectivity, it contributes to a heretofore unknown epidemic of cultural autism. Intimacy is now re-defined as a quality of interaction between the human body and the machine.[39] What about notions of privacy and hygiene? Who will have access to virtual reality applications and, more broadly, to the networks that serve as the infrastructure of the emerging information society? Sensory processing is a fertile field for scientific research. In fact, we are fascinated by the possibility that we may be able to technologically monitor brain functioning. Several sophisticated new visualization technologies - such as PET (positron emission tomography), MRI (magnetic resonance imaging), and MEG (magnetoencephalogy) - offer ways to visualize brain activity. In the best light, this is done in hopes of constructing a map of brain processing patterns; but even as these technologies promise new vistas for scientific research, the possibility for establishing new "biologically based" standards of body functioning - for example, defining what is "normal" according to neural firing patterns -suggests that this is not a politically neutral technology. The fact that new imaging technologies produce "better" images of human anatomy does not guarantee that doctors are using the images to produce "better" diagnoses and/or treatment programs for patients.[40] By analogy, the fact that virtual realities offer new information environments does not guarantee that people will use the information in better ways. It is just as likely that these new technologies will be used primarily to tell old stories - stories that reproduce, in hightech guise, traditional narratives about the gendered, race-marked body.

Notes: The Virtual Body in Cyberspace

[1] Mike Godwin, staff counsel for the Electronic Frontier Foundation (EFF), describes the EFF in his article "The Electronic Frontier Foundation and Virtual Communities," *Whole Earth Review* (Summer 1991): 40-42. In many ways participants in the EFF are working to ensure the democratic application of electronic networking, so although they participate in the same postmodern schizo-subculture I describe in this chapter, their objectives resonate with the liberatory rhetoric of a 1960s counterculture.

[2] John Perry Barlow, "Crime and Puzzlement: In Advance of the Law on the Electronic Frontier," *Whole Earth Review* (Fall 1990): 44-57. Quotation is from page 45.

[3] Here I'm describing elements of Internet, "a vast network of networks that interconnect thousands of computing sites in government, industry, and academia. The Internet has evolved from primarily providing electronic mail services to become the infrastructure for significantly broader services of information exchange and collaborative work. Like CompuServe, the heart of the Internet is a vast collection of newsgroups in which participants from around the world post and comment on messages" (46). Pamela Samuelson and Robert J. Glushko, "Intellectual Property Rights for Digital Library and Hypertext Publishing Systems: An Analysis of Xanadu," *Hypertext '91 Proceedings* Dec. 1991: 39-50.

[4] The term "virtual reality" has come under fire from some computer scientists who think that the term, like "artificial intelligence," names an impossible project; they offer the term "virtual worlds" as an alternative name for the space of virtuality. Brenda Laurel suggests the term "telepresence," to connote a medium rather than a place. Brenda Laurel, *Computers as Theatre* (Reading, Mass.: Addison-Wesley, 1991).

[5] The subculture of virtual reality was small enough in 1989-90 that the editors of a book titled *Virtual Reality: Theory, Practice, and Promise* (a reprint of the Summer 1990 issue of *Multimedia Review)* could include a directory of companies and individuals interested in VR. The list contained 63 entries. Sandra K. Helsel and Judith Paris Roth, eds. *Virtual Reality: Theory, Practice, and Promise* (Westport, Conn.: Meckler, 1991).

[6] William Gibson, *Neuromancer* (New York: Ace Science Fiction, 1984). Although William Gibson is widely credited with introducing cyberspace to a mass audience and spawning a new subgenre of science fiction called cyberpunk, he is only one of the cyberthinkers at work on the new frontier of reality science. Some scholars claim that Vernor Vinge was the first to introduce the notion of an alternative, electronically mediated plane in his novella *True Names* (New York: Dell, 1981). (See Michael B. Spring, "Informating with Virtual Reality," Helsel and Roth, *Virtual Reality* 3-17.*)* However, I also am reminded of the empathy box in Philip K. Dick's novel *Do Androids Dream Of Electric Sheep?* (New York: Doubleday, 1968*)* as an earlier forerunner.

[7] Gibson utilizes a wide range of technological metaphors and computer slang to describe data banks, net running, and the various practices associated with computer hacking. His description of the history of cyberspace has been quoted often:

> "The matrix has its roots in primitive arcade games," said the voice-over, "in early graphics programs and military experimentation with cranial jacks."... "Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts ... A graphic representation of data abstracted from the banks of every computer in the

human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding...."
Gibson, *Neuromancer* 51.

[8] Lanier is the source of many of the prophetic statements about the potential of virtual reality. See, for example, Kevin Kelly, "An Interview with Jaron Lanier: Virtual Reality," *Whole Earth Review* Fall 1989: 119*;* Steven Levy, "Brave New World," *Rolling Stone* 14 June 1990*:* 91-100; John Perry Barlow, "Life in the DataCloud: Scratching your Eyes Back In" (interview with Jaron Lanier), *Mondo 2000* 2 (Summer 1990):44-51.

[9]

[10] This list of topics refers to the following articles from *Mondo 2000* 4: "Winnelife: An Interview with Steve Roberts" by Gareth Branwyn, 32-35; "Durk and Sandy: Read This or Die" (on antioxidants), 41-44; "Avital Ronell on Hallucinogenres," interview by Gary Wolf, 63-69; "Antic Women" (an announcement about a new *ReSearch* issue by Avital Ronell, Kathy Acker, and Andrea Juno), 71; "Freaks of the industry: An Interview with the Digital Underground," by Rickey Vincent, 88-92; "The Carpal Tunnel of Love, Virtual Sex with Mike Saenz," interview by Jeff Milstead and Jude Milhon, 142-45. This issue also features a conversation between William S. Burroughs and Timothy Leary and an article on Jim Morrison on the occasion of Oliver Stone's film *The Doors* ("Orpheus in the Maelstrom," by Queen Mu, 129-34).

[11] The article is actually a review for a Dance Theater Workshop video screening project, "Cyberspatial Intersections," curated by Shalom Gorewitz, 21-23 Mar. 1991. As the press release describes, the series included video presentations about VPL products, special effects by Hollywood F/X companies, as well as computerized graphic art. Erik Davis, "Virtual Video," *Village Voice* 26 Mar. 1991: 41-42.

[12] Although as recently as 1980 cultural critics were explaining why art and technology were constructed as mutually exclusive domains, the engagement with art and visual artists has been part of the virtual reality industry from the very beginning. The ties to art and entertainment are the signal issues at meetings of ACM-SIGGRAPH (Association for Computing Machinery-Special Interest Group on Computer Graphics) and important early work on the interdisciplinary potential of VR as an artistic medium shows up in SIGGRAPH conference proceedings of 1989. The connections between VR and artistic expression are a persistent subtheme even in less spectacular conferences that focus on more serious issues related to the technological development of the machinehuman interface. For example, a research conference called "Virtual Worlds: Real Challenges," included sessions on applications for art and entertainment in addition to sessions on systems architecture, teleoperations, and biomedical applications. This conference, held 17-18 June 1991, was cosponsored by SRI International, the David Sarnoff Research Center, and VPL Research, Inc. (the company founded by Jaron Lanier in 1985). SRI and the David Sarnoff Research Center are electronic research organizations. Other events - such as "Art and Virtual Environments," a public symposium held as part of the Banff Center for the Arts' new project on virtual technologies as artistic media; the First and Second Artificial Life conferences, a Penn State symposium on computer learning; and special sessions of the Human Factors Society -have also taken up the issues of virtual reality and rely on VR "stars" such as Timothy Leary, Eric Gullichsen (president of Sense8), and researchers from the MIT Media Lab to draw crowds. Jack Burnham reviews the history of the art/technology schism as it has been constituted in the twentieth century

in "Art and Technology: The Panacea that Failed," *The Myths of Information: Technology and Postindustrial Culture* ed. Kathleen Woodward (Madison, Wis.: Coda, 1980) 200-15.

[13] Richard Kadrey is one of the regular reporters on the cyberspace beat, along with Howard Rheingold, Kevin Kelly for WER, Steve Diltea of *Omni*, and Randall Walser of Autodesk. Kadrey is quoted in "Cyberthon No. 1: Virtual Reality Fair in San Francisco," *Whole Earth Review* Winter 1990: 145.

[14] The irony has not been lost on the popular press; the page i headline in the *New York Times* announced "'Virtual Reality' Takes its Place in the Real World." In addition to regular reports in the *Whole Earth Review*, *Omni* magazine, and *Mondo 2000*, other popular press articles include: Erik Davis, "Virtual Video," *The Village Voice* 26 Mar. 1991: 41; Philip Elmer-Dewitt, "Through the 3-D Looking Glass, *Time* 1 May 1989: 65-66; "(Mis)Adventures in Cyberspace," *Time* 3 Sept. 1990: 74-76; Trish Hall, "'Virtual Reality'Takes Its Place in the Real," *New York Times* 8 July 1990, sec. I: 1, 14; Jim Harwood, "Agog in Goggles: Shape of Things to Come Reshaping Hollywood's Future," *Variety* (56th anniversary issue) 1989: 66; Steven Levy, "Brave New World," *Rolling Stone* June 1990: 92-98; A. J. S. Rayl, "The New, Improved Reality," *Los Angeles Times Magazine* 21 July 1991: 17-20; Sallie Tisdale, "It's Been Real," *Esquire* April 1991: 36; G. Pascal Zachary, "Artificial Reality: Computer Simulations One Day May Provide Surreal Experiences," *Wall Street journal* 23 Jan. 1990, sec. 1: 1; Gene Bylinsky, "The Marvels of 'Virtual Reality,'" *Fortune* 3 June 1991: 138-43; D'arcy Jenish, "Re-creating Reality," *Macleans* 4 June 1990: 56-58; Peter Lewis, "Put on Your Data Glove and Goggles and Step Inside," *New York Times* 20 May 1990: 8; Douglas Martin, "Virtual Reality! Hallucination! Age of Aquarius! Leary's Back! *New York Times* 2 Mar. 1991: 11; Edward Rothstein, "Just Some Games? Yes, But These Are Too Real," *New York Times* 4 Apr. 1991: B4; Richard Scheinin, "The Artificial Realist," *San Jose Mercury News* 29 Jan. 1990: 1-2; Julian Dibbell, "Virtual Kool-Aid Acid Test," *Spin* 4 Mar. 1991.

[15] David L. Wheeler, "Computer-Created World of 'Virtual Reality' Opening New Vistas to Scientists," *Chronicle of Higher Education* 37. 26 (13 Mar. 1991): A6.

[16] One of the earliest references cited in a 24-page bibliography on VR is the *Proceedings of a Symposium on Large-Scale Calculating Machinery* (Jan. 1947), reprinted in The Charles Babbage Institute Reprint Series for the History of Computing, Vol. 7 (Cambridge: MIT P, 1985). Norbert Wiener is known in some circles as "the father of cybernetics." Norbert Wiener, *Cybernetics or Control and Communication in the Animal and Machine*, New York: Technological Press, 1948; and *The Human Use of Human Beings: Cybernetics and Society* (New York: Doubleday, 1950)

[17] Myron W, Krueger, "Artificial Reality: Past and Future," Helsel and Roth, *Virtual Reality* 119-25; quotation is from page 22. Krueger suggests that work by Ivan Sutherland in the early 1960s influenced his own work on artificial reality, which began in the late ig6os and developed throughout the 1970s; Krueger's book *Artificial Reality* wasn't published until the mid-1980s, though (Menlo Park, Calif.: Addison-Wesley, 1983). From other sources we learn that Sutherland's PhD thesis, titled *Sketchpad: A Man-Machine Graphical Communication System*, is dated 1963; other articles published by Sutherland in the mid-ig6os were on the topic of a head-mounted, 3-D display. In T974, working with Robert Burton, he published work on a 3-D computer input device. Ivan Sutherland, "The Ultimate Display," *Proceedings IFIP Congress* (1965): 506-08; Ivan Sutherland, "A Head-Mounted Three-Dimensional Display," *Fall joint Computer Conference* 33 (1968): 757-64; Robert P. Burton and Ivan E. Sutherland, "Twinkle Box: A Three-Dimensional

Computer Input Device, *Proceedings of the National Computer Conference* (1974): 513-20.

[18] Although VPL had already developed the dataglove technology, it encountered difficulty finding a production source, so it licensed a version of the dataglove to Mattel Inc., which produced the "PowerGlove" for use with Nintendo video games. The other examples listed are culled from industry product literature (VPL, Cyberware, Sense8, Autodesk) and *Virtual World News,* the VPL newsletter.

[19] Randal Walser, "Elements of a Cyberspace Playhouse," Helsel and Roth, *Virtual Reality* 51-64 Quotation is from page 59. The contributor notes to the Helsel and Roth book state that Walser, manager of the Autodesk Cyberspace Project, has been interested in cyberspace for over 18 years as he has worked in many areas of artificial intelligence.

[20] From an article by A. J. S. Rayl, "Making Fun," *Omni* Nov. 1990: 42-48. Since 1990 several VR arcades featuring games such as "Dactyl Nightmare" and "Dactyl Nightmare II" have opened in malls across the United States. In Chicago there is a VR arcade entirely devoted to the BattleTech game that includes eighteen game "pods." Atlanta has "Dave and Busters" -an adult arcade and restaurant with VR games rigs, virtual golf, skee ball, and assorted pinball and blackjack tables. In Albuquerque, Blockbuster just opened its version of an adult arcade, called "Block Party," that includes not only VR games ("Dactyl Nightmare II" and "Virtu Alley") but also interactive videos such as "Go Motion Pictures" (moving seat films) and a new entertainment installation called "The PowerGrid" (described in *Wired* magazine as a techno habitrail for adults). "Romper Room for Grown-Ups," *Wired* June 1995: 43.

[21] Jack Zipes, "The Instrurnentalization of Fantasy: Fairy Tales and the Mass Media," *The Myths of Information: Technology and Postindustrial Culture* ed. Kathleen Woodward (Madison, WI Coda, 1980) 88-110. Quotation is from page 101.

[22] Sandra K. Helsel and Judith Paris Roth raise similar questions in their introduction to their book *Virtual Reality: Theory, Practice, and Promise.* They pose no answers and, in fact, comment on the lack of attention in their collection of articles to the issue of perspective or viewpoint: "Many feminist historians assert that written history is history according to white males. How will any individual or group carefully and sensitively, with a deep appreciation for cultural, racial, religious and gender bias, create virtual reality systems?" They go on to ask, "Will virtual reality systems be used as a means of breaking down cultural, racial, and gender barriers between individuals and thus foster 'human values'? Will virtual reality systems be multicultural in nature or will they only offer Western ways of assimilating knowledge? Will virtual realities systems serve as supplements to our lives, enriching us, or will individuals so miserable in their daily existences find an obsessive refuge in a preferred cyberspace" (ix-x). Good questions every one.

[23] Andrew Ross, "Hacking Away at the Counterculture," *Technoculture,* ed. Constance Penley and Andrew Ross (Minneapolis: U of Minnesota P, 1991) 107-34. Quotation is from page 126. Ross examines the ways that the hacker subculture has been interpreted by cultural critics. His intention is to complicate those interpretations in such a way as to resist the totalizing picture of new information technologies that would disallow its more liberatory use. He reminds readers that the meaning of any technology is constructed through a struggle among competing systems of understanding -those determined by broader social and institutional forces as well as those produced through individual subjective encounters. In the end, he argues that while we need to maintain a healthy

"technoskepticism," we must also understand that "technology must be seen as a lived, interpretive practice for people in their everyday lives"(131-32). Cultural critics are encouraged to develop a hacker-like knowledge about contemporary culture: "to make our knowledge about technoculture into something like a hacker's knowledge ... capableof ... rewriting the cultural programs and reprogramming the social values that make room for new technologies ... capable also of generating new popular romances around the alternative use of human ingenuity" (131).

[24] This quotation is from Randal Walser, reported in an article by Therese R. Welter, "The Artificial Tourist: Virtual Reality Promises New Worlds for Industry," *Industry Week* 1 Oct. 1990: 66. Using VR as an architectural tool to design and then interact with spaces before they are built is one of its more immediately practical applications. Another cyberspace environment, called "Traumabase," uses three-dimensional computer graphics to access information collected during the Vietnam War, ostensibly to "show the realities of war in text, pictures, films, and sounds" (70). In this case, the information database is organized by "creating a computer graphic construct ... representing contained information along important dimensions: location and severity of wounds, wound pattern clustering, wound pattern frequencies, survival patterns" (71). Joseph Henderson, "Designing Realities: Interactive Media, Virtual Realities, and Cyberspace," Helsel and Roth, *Virtual Reality* 65-73.

[25] Eric Gullichsen, the president of a small software company called *Sense8,* allowed me to try out his bio-apparatus and VR program. The head-mounted apparatus was rather primitive, held together by fishing clips and duct tape; and the software, called World-Tools, was a bit underwhelming. But that was as much due to the fact that WorldTools is a program for other programmers that enables them to create their own virtual realities as it was due in part to the fact that VR technology is still in its infancy. Prospective clients for such programs include art gallery directors, interior decorators, architects, and engineers

[26] According to Jean Baudrillard, a cultural shift has already taken place when the relationship between the "real" and the image is transformed from a relation of reflection to a relation of simulation; the current phase of the image "bears no relation to any reality whatever: it is its own simulacrum" (it). Baudrillard's cultural criticism is evocative and his elaboration of the logic of the simulacrurn helps make sense of U.S. media culture, but he remains within a logic of the image and the disembodied, which is not, in my opinion, a viable starting point for a feminist analysis of the cultural impact of VR technology. Jean Baudrillard, *Simulations* (New York: Semiotext(e), 1983).

[27] Richard Bolton elaborates modernism as an epistemological position that includes "a faith in rationalism, the rise of science and technology and the growth of capitalism" (35). He goes on to discuss the problems associated with the "ocular metaphors that inform modernist science, epistemology, and art," which leads him to argue that "our understanding of the world is limited by the 'spectator theory of knowledge' . . . inherited from rationalism" (35). His point is to describe how postmodernism offers an alternative epistemological framework. Richard Bolton, "The Modern Spectator and the Postmodern Participant," *Photo Communique* Summer 1986: 34-45.

[28] David Sudnow has provided the beginning description of such a phenomenology, although his trip through the microworld was confined to the two-dimensional space of a Pong game. David Sudnow, *Pilgrim in the Microworld* (New York: Warner, 1983).

[29] Spring poses several questions about the mechanics of thinking, what he calls "the process of informating," and how it is related to visual metaphors and models; one of his

questions is "How can the interconnectedness of ideas be visualized?" *(14).* See also Randal Walser, "Elements of a Cybernetic Playhouse."

[30] For example, Michael Spring has defined language as "an abstraction of reality with words and symbols representing various information loadings to the receiver" (11-12). Spring, "Informating with Virtual Reality." In his essay "Artificial Reality: Past and Future," Krueger argues that the future of artificial reality must include communication because "it is possible to capture everything that passes between two people in ways never before possible" (24).

[31] Randal Walser, "Elements of a Cyberspace Playhouse," 51.

[32] The 24 Feb. 1990 Doonesbury strip by Gary Trudeau offered a frame-by-frame depiction of the bomb's-eye view of a bomb traveling into a chemical weapons facility "past startled Iraqi production managers and into the office of the facility administrator." The next frame indicates an explosion, while the narrator (a general in the next frame) states: "Unfortunately, it continues through an open window and explodes in a nearby parking lot." Earnest Larsen considers the implications of what we didn't see during the television coverage of the Gulf War. Ernest Larsen, "Gulf War TV," *Jump Cut* 36 (1991): 3-10.

[33] Tisdale, "It's Been Real" 3

[34] Scott S. Fisher, "Virtual Environments: Personal Simulations and Telepresence," Helsel and Roth 101-10; quotation is from page 109

[35] Fred Pfeil, Another Tale to Tell: Politics and Narrative in Postmodern Culture (London:Verso, 1990) 88

[36] Outside of cyberspace, in an alternative universe, or some future postapocalyptic earth, heterosexual connections dominate the sexual scene. Consider two short stories in *Mirrorshades: The Cyberpunk Anthology*, edited by Bruce Sterling. In Marc Laidlaw's short story *"4oo* Boys," the gangs in Fun City, which include a gang of girls called the "Galrogs," unite together to fight off a new gang, the "400 Boys," for control of the city. Rice, the main character in Bruce Sterling and Lewis Shiner's short story "Mozart in Mirrorshades," becomes fascinated with Marie Antoinette: She "sprawled across the bed's expanse of pink satin, wearing a scrap of black-lace underwear and leafing through an issue of *Vogue*. . . . 'I want the leather bikini,' she said.... Rice leaned back across her solid thighs and patted her bottom reassuringly" *(*231). Bruce Sterling, ed. *Mirrorshades: The Cyberpunk Anthology* (New York: Ace, 1986).

[37] In their introduction, titled "Strange Attractor(s)," Rucker and Wilson describe contributions from three categories of writers: (1) "luminaries of the old New Wave: J. G. Ballard, Sol Yurick, and William Burroughs" (2) the loosely defined school of young writers sometimes called "cyberpunks" and (3) writers from the "underground world of xerox microzines and American samzidat: writers so radically marginalized they could never be co-opted, recuperated, reified, or bought out by the establishment" (13). Rudy Rucker and Peter Lamborn Wilson, eds., *Semiotext(e)* SF 5.2 (1989)

[38] Andrew Ross, "Cyberpunk in Boystown," *Strange Weather: Culture, Science and Technology in the Age of Limits* (London: Verso, 1991).

[39] Sherry Turkle and Seymour Papert argue that computer technologies may promote the development of epistemological pluralism. The most optimistic prophesy about virtual reality technologies would be consistent with their argument. But they go on to remind readers that the computer culture may inhibit the realization of such possibilities. Sherry Turkle and Seymour Papert, "Epistemological Pluralism: Styles and Voices within the Computer Culture," *SIGNS* 16.1 (Autumn 1990): 128-57.

[40] Using new imaging devices such as magnetic resonance imaging (MRI), scientists and physicians are able to look inside the brain to extract information about brain activity. Jon Van, "Understanding the Body through Imaging," *Chicago Tribune* 2 Aug. 1987*:* sec. 2, 1.

Positron emission tomography (PET) is another new imaging procedure that uses radioactive tracers to measure metabolic function as the brain "processes" information. Several scientists claim that the new imaging technologies will refine psychiatric diagnosis, so that trying to figure out what is "wrong" with someone won't be such a matter of guesswork anymore. As Dr. Floyd E. Bloom, chief of the Division of Preclinical Neuroscience and Endocrinology at the Research Institute of Scripps Clinic in LaJolla, explains, "We'll be able to be very precise, mechanical and quantitative about the differences between our brains at different times and between other brains under similar conditions. That kind of information will be totally useful in predicting what's wrong in mental illness." Ronald Kotulak, "Mind Readers: The Wondrous Machines That Let Scientists Watch Us Think," *Chicago Tribune* 9 May 1988*:* sec. 2., 2.

Magnetoencephalography (MEG) is a computer-based technology for looking inside the brain to determine whether thoughts are being generated. One recent article ("A Look Inside the Mysterious Brain") suggests that MEG and other new imaging techniques "are wonderful because they essentially turn the brain to glass so we can look inside and see what's going on.... This unprecedented view is expected to lead to methods for diagnosing mental disorders, predicting behavior and personality, evaluating mental capacities and basically determining when a brain is working well and when it is not." This would be an obvious benefit in treating coma patients, for example, but it has ominous overtones with respect to body privacy. Ronald Kotulak, "A Look Inside the Mysterious Brain," *Chicago Tribune 8* May *19 8 8:* sec. i, i, 12. See also two other articles by Ronald Kotulak, all in the *Chicago Tribune:* "Down Memory Lane: The Ability to Learn Is Mankind's Greatest Possession," *8* May 1988*:* sec. 2, 1, 3; "Mind Readers, " 9 May 1988*:* sec. 2, 1-2.

To peer inside the brain to see what areas light up when a person thinks about a hamburger may be an oblique way to "diagnose" obesity, but it also is a way to monitor subjective thoughts. Researchers working on brain-scanning devices unabashedly claim to want to find a way to "reveal people's inner thoughts as well as their innate mental talents" - a capability the military is interested in for selecting tank drivers and fighter pilots (Kotulak, "A Look Inside the Mysterious Brain," i). In a study of Alzheimer's disease, electroencephalogram scans from Alzheimer's patients are compared to "healthy" people's brain scans and are found to have fewer alpha-range waves and more delta waves; however, the process whereby someone is diagnosed as "healthy" is rarely discussed in any of the popular media reports on brain imaging. Kathleen Doheny, "Alzheimer's Disease: Science Struggles to Ease the Nightmare," *Los Angeles Times* 5 June 1989*:* sec. 2, 7; and Jon Van, "New Image Scan's Value Is Unproven, AMA Says," *Chicago Tribune* 10 June 1988*:* sec. 2, 3.

These new technologies raise serious ethical questions tied not so much to the possibilities of treating "disease" or "mental disorders" but to the possibilities of using the very same technology to pigeonhole people according to brain activity profiles.