

## Will the Real Body Please Stand Up?

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### The Machines Are Restless Tonight

After Donna Haraway's "Promises of Monsters" and Bruno Latour's papers on actor networks and artifacts that speak, I find it hard to think of any artifact as being devoid of agency. Accordingly, when the dryer begins to beep complainingly from the laundry room while I am at dinner with friends, we raise eyebrows at each other and say simultaneously, "The machines are restless tonight . . ."

It's not the phrase, I don't think, that I find intriguing. Even after Haraway 1991 and Latour 1988, the phrase is hard to appreciate in an intuitive way. It's the ellipsis I notice. You can hear those three dots. What comes after them? The fact that the phrase--obviously a sendup of a vaguely anthropological chestnut--seems funny to us, already says a great deal about the way we think of our complex and frequently uneasy imbrications with the unliving. I, for one, spend more time interacting with Saint-John Perse, my affectionate name for my Macintosh computer, than I do with my friends. I appreciate its foibles, and it gripes to me about mine. That someone comes into the room and reminds me that Perse is merely a "passage point" for the work practices of a circle of my friends over in Silicon Valley changes my sense of facing a vague but palpable sentience squatting on my desk not one whit. The people I study are deeply imbricated in a complex social network mediated by little technologies to which they have delegated significant amounts of their time and agency, not to mention their humor. I say to myself: Who am I studying? A group of people? Their machines? A group of people and or in their machines? Or something else?

When I study these groups, I try to pay attention to all of their interactions. And as soon as I allow myself to see that most of the interactions of the people I am studying involve vague but palpable sentiences squatting on their desks, I have to start thinking about watching the machines just as attentively as I watch the people, because, for them, the machines are not merely passage points. Haraway and other workers who observe the traffic across the boundaries between "nature," "society," and "technology" tend to see nature as lively, unpredictable, and, in some sense, actively resisting interpretations. If nature and technology seem to be collapsing into each other, as Haraway and others claim, then the unhumans can be lively too. One symptom of this is that the flux of information that passes back and forth across the vanishing divides between nature and technology has become extremely dense. Cyborgs with a vengeance, one of the groups I study, is already talking about colonizing a social space in which the divide between nature and technology has become thoroughly unrecognizable, while one of the individuals I study is busy trying to sort out how the many people who seem to inhabit the social space of her body are colonizing her. When I listen to the voices in these new social spaces I hear a multiplicity of voices, some recognizably human and some quite different, all clamoring at once, frequently saying things whose meanings are tantalizingly familiar but which have subtly changed.

My interest in cyberspace is primarily about communities and how they work. Because I believe that technology and culture constitute each other, studying the actors and actants that make up our lively, troubling, and productive technologies tells me about the actors and actants that make up our culture. Since so much of a culture's knowledge is passed on by means of stories, I will begin by retelling a few boundary stories about virtual cultures.

### Schizophrenia as Commodity Fetish

Let us begin with a person I will call Julie, on a computer conference in New York in 1985. Julie was a totally disabled older woman, but she could push the keys of a computer with her headstick. The personality she projected into the "net"--the vast electronic web that links computers all over the world--was huge. On the net, Julie's disability was invisible and irrelevant. Her standard greeting was a big, expansive "HI!!!!!!!" Her heart was as big as her greeting, and in the intimate electronic companionships that can develop during on-line conferencing between people who may never physically meet, Julie's women friends shared their deepest troubles, and she offered them advice--advice

that changed their lives. Trapped inside her ruined body, Julie herself was sharp and perceptive, thoughtful and caring.

After several years, something happened that shook the conference to the core. "Julie" did not exist. "She" was, it turned out, a middle-aged male psychiatrist. Logging onto the conference for the first time, this man had accidentally begun a discussion with a woman who mistook him for another woman. "I was stunned," he said later, "at the conversational mode. I hadn't known that women talked among themselves that way. There was so much more vulnerability, so much more depth and complexity. Men's conversations on the nets were much more guarded and superficial, even among intimates. It was fascinating, and I wanted more." He had spent weeks developing the right persona. A totally disabled, single older woman was perfect. He felt that such a person wouldn't be expected to have a social life. Consequently her existence only as a net persona would seem natural. It worked for years, until one of Julie's devoted admirers, bent on finally meeting her in person, tracked her down.

The news reverberated through the net. Reactions varied from humorous resignation to blind rage. Most deeply affected were the women who had shared their innermost feelings with Julie. "I felt raped," one said. "I felt that my deepest secrets had been violated." Several went so far as to repudiate the genuine gains they had made in their personal and emotional lives. They felt those gains were predicated on deceit and trickery.

The computer engineers, the people who wrote the programs by means of which the nets exist, just smiled tiredly. They had understood from the beginning the radical changes in social conventions that the nets implied. Young enough in the first days of the net to react and adjust quickly, they had long ago taken for granted that many of the old assumptions about the nature of identity had quietly vanished under the new electronic dispensation. Electronic networks in their myriad kinds, and the mode of interpersonal interaction that they foster, are a new manifestation of a social space that has been better known in its older and more familiar forms in conference calls, communities of letters, and FDR's fireside chats. It can be characterized as "virtual" space--an imaginary locus of interaction created by communal agreement. In its most recent form, concepts like distance, inside/outside, and even the physical body take on new and frequently disturbing meanings.

Now, one of the more interesting aspects of virtual space is "computer crossdressing." Julie was an early manifestation. On the nets, where warranting or grounding, a persona in a physical body, is meaningless, men routinely use female personae whenever they choose, and vice versa. This wholesale appropriation of the other has spawned new modes of interaction. Ethics, trust, and risk still continue, but in different ways. Gendered modes of communication themselves have remained relatively stable, but who uses which of the two socially recognized modes has become more plastic. A woman who has appropriated a male conversational style may be simply assumed to be male at that place and time, so that her/his on-line persona takes on a kind of quasi life of its own, separate from the person's embodied life in the "real" world.

Sometimes a person's on-line persona becomes so finely developed that it begins to take over their life off the net. In studying virtual systems, I will call both the space of interaction that is the net and the space of interaction that we call the "real" world consensual loci. Each consensual locus has its own "reality," determined by local conditions. However, not all realities are equal. A whack on the head in the "real" world can kill you, whereas a whack in one of the virtual worlds will not (although a legal issue currently being debated by futurist attorneys is what liability the whacker has if the fright caused by a virtual whack gives the whackee a "real" heart attack).

Some conferencees talk of a time when they will be able to abandon warranting personae in even more complex ways, when the first "virtual reality" environments come on line. VR, one of a class of interactive spaces that are coming to be known by the general term cyberspace, is a three-dimensional consensual locus or, in the terms of science fiction author William Gibson, a "consensual hallucination" in which data may be visualized, heard, and even felt. The "data" in some of these virtual environments are people--3-D representations of individuals in the cyberspace. While high-resolution images of the human body in cyberspace are years away, when they arrive they will take "computer crossdressing" even further. In this version of VR a man may be seen, and perhaps touched, as a woman and vice versa--or as anything else. There is talk of renting prepackaged body forms complete with voice and touch . . . multiple personality as commodity fetish!

It is interesting that at just about the time the last of the untouched "real-world" anthropological field sites are disappearing, a new and unexpected kind of "field" is opening up--incontrovertibly social spaces in which people still

meet face-to-face, but under new definitions of both "meet" and "face." These new spaces instantiate the collapse of the boundaries between the social and technological, biology and machine, natural and artificial that are part of the postmodern imaginary. They are part of the growing imbrication of humans and machines in new social forms that I call virtual systems.

#### A Virtual Systems Origin Myth

Cyberspace, without its high-tech glitz, is partially the idea of virtual community. The earliest cyberspaces may have been virtual communities, passage points for collections of common beliefs and practices that united people who were physically separated. Virtual communities sustain themselves by constantly circulating those practices. To give some examples of how this works, I'm going to tell an origin story of virtual systems.

There are four epochs in this story. The beginning of each is signaled by a marked change in the character of human communication. Over the years, human communication is increasingly mediated by technology. Because the rate of change in technological innovation increases with time, the more recent epochs are shorter, but roughly the same quantity of information is exchanged in each. Since the basis of virtual communities is communication, this seems like a reasonable way to divide up the field.

Epoch One: Texts. [From the mid-1600s]

Epoch Two: Electronic communication and entertainment media. [1900+]

Epoch Three: Information technology. [1960+]

Epoch Four: Virtual reality and cyberspace. [1984+]

#### Epoch One

This period of early textual virtual communities starts, for the sake of this discussion, in 1669 when Robert Boyle engaged an apparatus of literary technology to "dramatize the social relations proper to a community of philosophers." As Steven Shapin and Simon Shapiro point out in their study of the debate between Boyle and the philosopher Thomas Hobbes, *Leviathan and the Air-Pump*, we probably owe the invention of the boring academic paper to Boyle. Boyle developed a method of compelling assent that Shapin and Shaffer described as virtual witnessing. He created what he called a "community of like-minded gentlemen" to validate his scientific experiments, and he correctly surmised that the "gentlemen" for whom he was writing believed that boring, detailed writing implied painstaking experimental work. Consequently it came to pass that boring writing was likely to indicate scientific truth. By means of such writing, a group of people were able to "witness" an experiment without being physically present. Boyle's production of the detailed academic paper was so successful that it is still the exemplar of scholarship.

The document around which community forms might also be a novel, a work of fiction. Arguably the first texts to reach beyond class, gender, and ideological differences were the eighteenth-century sentimental novels, exemplified by the publication of Bernardin de Saint-Pierre's short novel *Paul and Virginia* (1788), which Roddey Reid, in his study "Tears For Fears," identifies as one of the early textual productions that "dismantled the absolutist public sphere and constructed a bourgeois public sphere through fictions of national community." Reid claims that *Paul and Virginia* was a passage point for a circulating cluster of concepts about the nature of social identity that transformed French society. Reid suggests that an entire social class--the French bourgeoisie--crystallized around the complex of emotional responses that the novel produced. Thus in the first epoch texts became ways of creating, and later of controlling, new kinds of communities.

#### Epoch Two

The period of the early electronic virtual communities began in the twentieth century with invention of the telegraph and continued with musical communities, previously constituted in the physical public space of the concert hall, shifting and translating to a new kind of virtual communal space around the phonograph. The apex of this period was Franklin Delano Roosevelt's radio "fireside chats," creating a community by means of readily available technology.

Once communities grew too big for everyone to know everyone else, which is to say very early on, government had to proceed through delegates who represented absent groups. FDR's use of radio was a way to bypass the need for delegates. Instead of talking to a few hundred representatives, Roosevelt used the radio as a machine for fitting listeners into his living room. The radio was one-way communication, but because of it people were able to begin to think of presence in a different way. Because of radio and of the apparatus for the production of community that it implied and facilitated, it was now possible for millions of people to be "present" in the same space--seated across from Roosevelt in his living room.

This view implies a new, different, and complex way of experiencing the relationship between the physical human body and the "I" that inhabits it. FDR did not physically enter listeners' living rooms. He invited listeners into his. In a sense, the listener was in two places at once--the body at home, but the delegate, the "I" that belonged to the body, in an imaginal space with another person. This space was enabled and constructed with the assistance of a particular technology. In the case of FDR the technology was a device that mediated between physical loci and incommensurable realities--in other words, an interface. In virtual systems an interface is that which mediates between the human body (or bodies) and an associated "I" (or "I's"). This double view of "where" the "person" is, and the corresponding trouble it may cause with thinking about "who" we are talking about when we discuss such a problematic "person," underlies the structure of more recent virtual communities.

During the same period thousands of children, mostly boys, listened avidly to adventure serials, and sent in their coupons to receive the decoder rings and signaling devices that had immense significance within the community of a particular show. Away from the radio, they recognized each other by displaying the community's tokens, an example of communities of consumers organized for marketing purposes.

The motion picture, and later, television, also mobilized a similar power to organize sentimental social groups. Arguably one of the best examples of a virtual community in the late twentieth century is the Trekkies, a huge, heterogeneous group partially based on commerce but mostly on a set of ideas. The fictive community of "Star Trek" and the fantasy Trekkie community interrelate and mutually constitute each other in complex ways across the boundaries of texts, films, and video interfaces.

Epoch Two ended in the mid-1970s with the advent of the first computer, terminal-based, bulletin board systems (BBSs).

### Epoch Three

This period began with the era of information technology. The first virtual communities based on information technology were the on-line bulletin board services (BBS) of the middle 1970s. These were not dependent upon the widespread ownership of computers, merely of terminals. But because even a used terminal cost several hundred dollars, access to the first BBSs was mainly limited to electronics : experimenters, ham-radio operators, and the early hardy computer builders.

BBSs were named after their perceived function--virtual places, conceived to be just like physical bulletin boards, where people could post notes for general reading. The first successful BBS programs were primitive, usually allowing the user to search for messages alphabetically, or simply to read messages in the order in which they were posted. These programs were sold by their authors for very little, or given away as "shareware"--part of the early visionary ethic of electronic virtual communities. The idea of shareware, as enunciated by the many programmers who wrote shareware programs, was that the computer was a passage point for circulating concepts of community. The important thing about shareware, rather than making an immediate profit for the producer, was to nourish the community in expectation that such nourishment would "come around" to the nourisher.

CommuniTree. Within a few months of the first BBS's appearance, a San Francisco group headed by John James, a programmer and visionary thinker, had developed the idea that the BBS was a virtual community, a community that promised radical transformation of existing society and the emergence of new social forms. The CommuniTree Group, as they called themselves, saw the BBS in McLuhanesque terms as transformative because of the ontological structure it presupposed and simultaneously created--the mode of tree-structured discourse and the community that spoke it--and because it was another order of "extension," a kind of prosthesis in McLuhan's sense. The BBS that the CommuniTree Group envisioned was an extension of the participant's instrumentality into a virtual social space.

The CommuniTree Group quite correctly foresaw that the BBS in its original form was extremely limited in its usefulness. Their reasoning was simple. The physical bulletin board for which the BBS was the metaphor had the advantage of being quickly scannable. By its nature, the physical bulletin board was small and manageable in size. There was not much need for bulletin boards to be organized by topic. But the on-line BBS could not be scanned in any intuitively satisfactory way. There were primitive search protocols in the early BBSs, but they were usually restricted to alphabetical searches or searches by keywords. The CommuniTree Group proposed a new kind of BBS that they called a tree-structured conference, employing as a working metaphor both the binary tree protocols in computer science and also the organic qualities of trees as such appropriate to the 1970s. Each branch of the tree was to be a separate conference that grew naturally out of its root message by virtue of each subsequent message that was attached to it. Conferences that lacked participation would cease to grow, but would remain on-line as archives of failed discourse and as potential sources of inspiration for other, more flourishing conferences.

With each version of the BBS system, The CommuniTree Group supplied a massive, detailed instruction manual--which was nothing less than a set of directions for constructing a new kind of virtual community. They couched the manual in radical seventies language, giving chapters such titles as "Downscale, please, Buddha" and "If you meet the electronic avatar on the road, laserblast hir! " This rich intermingling of spiritual and technological imagery took place in the context of George Lucas's Star Wars, a film that embodied the themes of the technological transformativists, from the all-pervading Force to what Vivian Sobchack (1987) called "the outcome of infinite human and technological progress." It was around Star Wars in particular that the technological and radically spiritual virtual communities of the early BBSs coalesced. Star Wars represented a future in which the good guys won out over vastly superior adversaries--with the help of a mystical Force that "surrounds us and penetrates us . . . it binds the galaxy together" and which the hero can access by learning to "trust your feelings"--a quintessential injunction of the early seventies.

CommuniTree #1 went on-line in May 1978 in the San Francisco Bay area of northern California, one year after the introduction of the Apple II computer and its first typewritten and hand-drawn operating manual. CommuniTree #2 followed quickly. The opening sentence of the prospectus for the first conference was "We are as gods and might as well get good at it." This technospiritual bumptiousness, full of the promise of the redemptive power of technology mixed with the easy, catch-all Eastern mysticism popular in upscale northern California, characterized the early conferences. As might be gathered from the tone of the prospectus, the first conference, entitled "Origins," was about successor religions.

The conferencees saw themselves not primarily as readers of bulletin boards or participants in a novel discourse but as agents of a new kind of social experiment. They saw the terminal or personal computer as a tool for social transformation by the ways it refigured social interaction. BBS conversations were time-aliased, like a kind of public letter writing or the posting of broadsides. They were meant to be read and replied to some time later than they were posted. But their participants saw them as conversations nonetheless, as social acts. When asked how sitting alone at a terminal was a social act, they explained that they saw the terminal as a window into a social space. When describing the act of communication, many moved their hands expressively as though typing, emphasizing the gestural quality and essential tactility of the virtual mode. Also present in their descriptions was a propensity to reduce other expressive modalities to the tactile. It seemed clear that, from the beginning, the electronic virtual mode possessed the power to overcome its character of single-mode transmission and limited bandwidth.

By 1982 Apple Computer had entered into the first of a series of agreements with the federal government in which the corporation was permitted to give away computers to public schools in lieu of Apple's paying a substantial portion of its federal taxes. In terms of market strategy, this action dramatically increased Apple's presence in the school system and set the pace for Apple's domination in the education market. Within a fairly brief time there were significant numbers of personal computers accessible to students of grammar school and high school age. Some of those computers had modems.

The students, at first mostly boys and with the linguistic proclivities of pubescent males, discovered the Tree's phone number and wasted no time in logging onto the conferences. They appeared uninspired by the relatively intellectual and spiritual air of the ongoing debates, and proceeded to express their dissatisfaction in ways appropriate to their age, sex, and language abilities. Within a short time the Tree was jammed with obscene and scatological messages. There was no way to monitor them as they arrived, and no easy way to remove them once they were in the

system. This meant that the entire system had to be purged--a process taking hours--every day or two. In addition, young hackers enjoyed the sport of attempting to "crash" the system by discovering bugs in the system commands. Because of the provisions of the system that made observing incoming messages impossible, the hackers were free to experiment with impunity, and there was no way for the system operator to know what was taking place until the system crashed. At that time it was generally too late to save the existing disks. The system operator would be obliged to reconstitute ongoing conferences from earlier backup versions.

Within a few months, the Tree had expired, choked to death with what one participant called "the consequences of freedom of expression." During the years of its operation, however, several young participants took the lessons and implications of such a community away with them, and proceeded to write their own systems. Within a few years there was a proliferation of on-line virtual communities of somewhat less visionary character but vastly superior message-handling capability--systems that allowed monitoring and disconnection of "troublesome" participants (hackers attempting to crash the system), and easy removal of messages that did not further the purposes of the system operators. The age of surveillance and social control had arrived for the electronic virtual community.

The visionary character of CommuniTree's electronic ontology proved an obstacle to the Tree's survival. Ensuring privacy in all aspects of the Tree's structure and enabling unlimited access to all conferences did not work in a context of increasing availability of terminals to young men who did not necessarily share the Tree gods' ideas of what counted as community. As one Tree veteran put it, "The barbarian hordes mowed us down." Thus, in practice, surveillance and control proved necessary adjuncts to maintaining order in the virtual community.

It is tempting to speculate about what might have happened if the introduction of CommuniTree had not coincided with the first wave of "computerjugen." Perhaps the future of electronic virtual communities would have been quite different.

SIMNET. Besides the BBSs, there were more graphic, interactive systems under construction. Their interfaces were similar to arcade games or flight simulators--(relatively) high-resolution, animated graphics. The first example of this type of cyberspace was a military simulation called SIMNET. SIMNET was conducted by a consortium of military interests, primarily represented by DARPA, and a task group from the Institute for Simulation and Training, located at the University of Central Florida. SIMNET came about because DARPA was beginning to worry about whether the Army could continue to stage large-scale military practice exercises in Germany. With the rapid and unpredictable changes that were taking place in Europe in the late 1980s, the army wanted to have a backup--some other place where they could stage practice maneuvers without posing difficult political questions. As one of the developers of SIMNET put it, "World War III in Central Europe is at the moment an unfashionable anxiety. " In view of the price of land and fuel, and of the escalating cost of staging practice maneuvers, the armed forces felt that if a large-scale consensual simulation could be made practical they could realize an immediate and useful financial advantage. Therefore, DARPA committed significant resources--money, time, and computer power--to funding some research laboratory to generate a 200-tank cyberspace simulation. DARPA put out requests for proposals, and a group at the University of Central Florida won.

The Florida group designed and built the simulator units with old technology, along the lines of conventional aircraft cockpit simulators. Each tank simulator was equipped to carry a crew of four, so the SIMNET environment is an 800-person virtual community.

SIMNET is a two-dimensional cyberspace. The system can be linked up over a very large area geographically; without much difficulty, in fact, to anywhere in the world. A typical SIMNET node is an M-1 tank simulator. Four crew stations contain a total of eight vision blocks, or video screens, visible through the tank's ports. Most of these are 320 x 138 pixels in size, with a 15 Hertz update rate. This means that the image resolution is not very good, but the simulation can be generated with readily available technology no more complex than conventional video games. From inside the "tank" the crew looks out the viewports, which are the video screens. These display the computer-generated terrain over which the tanks will maneuver (which happens to be the landscape near Fort Knox, Kentucky). Besides hills and fields, the crew can see vehicles, aircraft, and up to 30 other tanks at one time. They can hear and see the vehicles and planes shooting at each other and at them.

By today's standards, SIMNET's video images are low-resolution and hardly convincing. There is no mistaking the view out the ports for real terrain. But the simulation is astonishingly effective, and participants become thoroughly

caught up in it. SIMNET's designers believe that it may be the lack of resolution itself that is responsible, since it requires the participants to actively engage their own imaginations to fill the holes in the illusion! McLuhan redux. That it works is unquestionable. When experimenters opened the door to one of the simulators during a test run to photograph the interior, the participants were so caught up in the action that they didn't notice the bulky camera poking at them .

Habitat, designed by Chip Morningstar and Randall Farmer, is a large-scale social experiment that is accessible through such common telephone-line computer networks as Tymnet. Habitat was designed for LucasFilm, and has been on-line for about a year and a half. It is a completely decentralized, connectionist system. The technology at the user interface was intended to be simple, this in order to minimize the costs of getting on-line. Habitat is designed to run on a Commodore 64 computer, a piece of very old technology in computer terms (in other words, at least ten years old), but Morningstar and Farmer have milked an amazing amount of effective bandwidth out of the machine. The Commodore 64 is very inexpensive and readily available. Almost anyone can buy one if, as one Habitat participant said, "they don't already happen to have one sitting around being used as a doorstop." Commodore 64s cost \$100 at such outlets as Toys R Us.

Habitat existed first as a 35-foot mural located in a building in Sausalito, California, but, on-line, each area of the mural represents an entirely expandable area in the cyberspace, be it a forest, a plain, or a city. Habitat is inhabitable in that, when the user signs on, he or she has a window into the ongoing social life of the cyberspace--the community "inside" the computer. The social space itself is represented by a cartoonlike frame. The virtual person who is the user's delegated agency is represented by a cartoon figure that may be customized from a menu of body parts. When the user wishes his/her character to speak, s/he types out the words on the Commodore's keyboard, and these appear in a speech balloon over the head of the user's character. The speech balloon is visible to any other user nearby in the virtual space.[1] The user sees whatever other people are in the immediate vicinity in the form of other figures.

Habitat is a two-dimensional example of what William Gibson called a "consensual hallucination." First, according to Morningstar and Farmer, it has well-known protocols for encoding and exchanging information. By generally accepted usage among cyberspace engineers, this means it is consensual. The simulation software uses agents that can transform information to simulate environment. This means it is an hallucination.

Habitat has proved to be incontrovertibly social in character. During Habitat's beta test, several social institutions sprang up spontaneously. As Randall Farmer points out in his report on the initial test run, there were marriages and divorces, a church (complete with a real-world Greek Orthodox minister), a loose guild of thieves, an elected sheriff (to combat the thieves), a newspaper with a rather eccentric editor, and before long two lawyers hung up their shingles to sort out claims. And this was with only 150 people. My vision (of Habitat) encompasses tens of thousands of simultaneous participants.

Lessons of the Third Epoch. In the third epoch the participants of electronic communities seem to be acquiring skills that are useful for the virtual social environments developing in late twentieth-century technologized nations. Their participants have learned to delegate their agency to body-representatives that exist in an imaginal space contiguously with representatives of other individuals. They have become accustomed to what might be called lucid dreaming in an awake state--to a constellation of activities much like reading, but an active and interactive reading, a participatory social practice in which the actions of the reader have consequences in the world of the dream or the book.

In the third epoch the older metaphor of reading is undergoing a transformation in a textual space that is consensual, interactive, and haptic, and that is constituted through inscription practices--the production of microprocessor code. Social spaces are beginning to appear that are simultaneously natural, artificial, and constituted by inscription. The boundaries between the social and the natural and between biology and technology are beginning to take on the generous permeability that characterizes communal space in the fourth epoch.

#### Epoch Four

Arguably the single most significant event for the development of fourthstage virtual communities was the publication of William Gibson's science fiction novel *Neuromancer*. *Neuromancer* represents the dividing line between the third and fourth epochs not because it signaled any technological development, but because it crystallized a new

community, just as Boyle's scientific papers and Paul and Virginia did in an earlier age.

Neuromancer reached the hackers who had been radicalized by George Lucas's powerful cinematic evocation of humanity and technology infinitely extended, and it reached the technologically literate and socially disaffected who were searching for social forms that could transform the fragmented anomie that characterized life in Silicon Valley and all electronic industrial ghettos. In a single stroke, Gibson's powerful vision provided for them the imaginal public sphere and refigured discursive community that established the grounding for the possibility of a new kind of social interaction. As with Paul and Virginia in the time of Napoleon and Dupont de Nemours, Neuromancer in the time of Reagan and DARPA is a massive intertextual presence not only in other literary productions of the 1980s, but in technical publications, conference topics, hardware design, and scientific and technological discourses in the large.

The three-dimensional inhabitable cyberspace described in Neuromancer does not yet exist, but the groundwork for it can be found in a series of experiments in both the military and private sectors.

Many VR engineers concur that the tribal elders of 3-D virtual systems are Scott Fisher and Ivan Sutherland, formerly at MIT, and Tom Furness, with the Air Force. In 1967-68, Sutherland built a see-through helmet at the MIT Draper Lab in Cambridge. This system used television screens and half-silvered mirrors, so that the environment was visible through the TV displays. It was not designed to provide a surround environment. In 1969-70 Sutherland went to the University of Utah, where he continued this work, doing things with vector-generated computer graphics and maps, still see-through technology. In his lab were Jim Clark, who went on to start Silicon Graphics, and Don Vickers.

Tom Furness had been working on VR systems for 15 years or more--he started in the mid-seventies at Wright-Patterson Air Force Base. His systems were also see-through, rather than enclosing. He pushed the technology forward, particularly by adopting the use of high-resolution CRTs. Furness's system, designed for the USAF, was an elaborate flight simulation cyberspace employing a helmet with two large CRT devices, so large and cumbersome that it was dubbed the "Darth Vader helmet." He left Wright-Patterson in 1988-89 to start the Human Interface Technology Lab at the University of Washington.

Scott Fisher started at MIT in the machine architecture group. The MA group worked on developing stereo displays and crude helmets to contain them, and received a small proportion of their funding from DARPA. When the group terminated the project, they gave the stereo displays to another group at UNC (University of North Carolina), which was developing a display device called the Pixel Planes Machine. In the UNC lab were Henry Fuchs and Fred Brooks, who had been working on force feedback with systems previously developed at Argonne and Oak Ridge National labs. The UNC group worked on large projected stereo displays, but was aware of Sutherland's and Furness's work with helmets, and experimented with putting a miniature display system into a helmet of their own. Their specialties were medical modeling, molecular modeling, and architectural walk-through. The new Computer Science building at UNC was designed partially with their system. Using their software and 3-D computer imaging equipment, the architects could "walk through" the full-sized virtual building and examine its structure. The actual walk-through was accomplished with a treadmill and bicycle handlebars. The experiment was so successful that during the walk-through one of the architects discovered a misplaced wall that would have cost hundreds of thousands of dollars to fix once the actual structure had been built.

In 1982, Fisher went to work for Atari. Alan Kay's style at Atari was to pick self-motivated people and then turn them loose, on anything from flight simulation to personal interactive systems. The lab's philosophy was at the extreme end of visionary. According to Kay, the job of the group was to develop products not for next year or even for five years away, but for no less than 15 to 20 years in the future. In the corporate climate of the 1980s, and in particular in Silicon Valley, where product life and corporate futures are calculated in terms of months, this approach was not merely radical but stratospheric. For the young computer jocks, the lure of Silicon Valley and of pushing the limits of computer imaging into the far future was irresistible, and a group of Cambridge engineers, each outstanding in their way, made the trek out to the coast. Eric Gullichsen arrived first, then Scott Fisher and Susan Brennan, followed a year later by Ann Marion. Michael Naimark was already there, as was Brenda Laurel. Steve Gans was the last to arrive.

As it turned out, this was not a good moment to arrive at Atari. When the Atari lab closed, Ann Marion and Alan Kay went to Apple (followed by a drove of other Atari expatriates), where they started the Vivarium project and



continued their research. Susan Brennan went first to the Stanford Psychology Department and also Hewlett-Packard, which she left in 1990 to teach at CUNY Stony Brook. Michael Naimark became an independent producer and designer of interactive video and multimedia art. William Bricken and Eric Gullichsen took jobs at Autodesk, the largest manufacturer of CAD software, where they started a research group called Cyberia.

Scott Fisher went to work for Dave Nagel, head of the NASA-Ames View Lab. To go with their helmet, the Ames lab had developed a primitive sensor to provide the computer with information about the position of the user's hand. The early device used a simple glove with strain gauges wired to two fingers. They contracted with VPL, Inc. to develop it further, using software written in collaboration with Scott. The Ames group referred to the software as "gesture editors." The contract started in 1985, and VPL delivered the first glove in March 1986. The Ames group intended to apply the glove and software to such ideas as surgical simulation, 3-D virtual surgery for medical students. In 1988, Dave Nagel left the Ames laboratory to become director of the Advanced Technology Group (ATG) at Apple.

Lusting for images, such organizations as SIGGRAPH gobbled up information about the new medium and spread it out through its swarm of networks and publications. The audience, made up largely of young, talented, computer-literate people in both computer science and art, and working in such fields as advertising, media, and the fine arts, had mastered the current state of the art in computers and was hungry for the next thing. LucasFilm (later LucasArts) in Marin, now doing the bulk of all computerized special effects for the film industry, and Douglas Trumbull's EEG in Hollywood, fresh from their spectacular work on Blade Runner, had made the production of spectacular visual imaginaries an everyday fact. They weren't afraid to say that they had solved all of the remaining problems with making artificial images, under particular circumstances, indistinguishable from "real" ones--a moment that Stewart Brand called "(t)he end of photography as evidence for anything." Now the artists and engineers who worked with the most powerful imaging systems, like Lucas's Pixar, were ready for more. They wanted to be able to get inside their own fantasies, to experientially inhabit the worlds they designed and built but could never enter. VR touched the same nerve that Star Wars had, the englobing specular fantasy made real.

Under Eric Gullichsen and William Bricken, the Autodesk Cyberspace Project quickly acquired the nickname Cyberia. John Walker, president of Autodesk, had seen the UNC architectural system and foresaw a huge market for virtual CAD--3-D drawings that the designers could enter. But after a year or so, Autodesk shrank the Cyberia project. Eric Gullichsen left to start Sense8, a manufacturer of low-end VR systems. William Bricken (and later his wife Meredith) left the company to take up residence at the University of Washington, where Tom Furness and his associates had started the Human Interface Technology Laboratory. Although there were already academic-based research organizations in existence at that time (Florida, North Carolina), and some of them (Florida) were financed at least in part by DOD, the HIT lab became the first academic organization to secure serious research funding from private industry.

During this period, when Neuromancer was published, "virtual reality" acquired a new name and a suddenly prominent social identity as "cyberspace." The critical importance of Gibson's book was partly due to the way that it triggered a conceptual revolution among the scattered workers who had been doing virtual reality research for years: As task groups coalesced and dissolved, as the fortunes of companies and projects and laboratories rose and fell, the existence of Gibson's novel and the technological and social imaginary that it articulated enabled the researchers in virtual reality--or, under the new dispensation, cyberspace--to recognize and organize themselves as a community.

By this time private industry, represented by such firms as American Express, PacBell, IBM, MCC, Texas Instruments, and NYNEX, were beginning to explore the possibilities and commercial impact of cyberspace systems. That is not to say that people were rushing out to purchase tickets for a cyberspace vacation! The major thrust of the industrial and institutional commitment to cyberspace research was still focused on data manipulation--just as Gibson's zaibatsu did in Neuromancer. Gibson's cowboys were outlaws in a military-industrial fairyland dominated by supercomputers, artificial intelligence devices, and data banks. Humans were present, but their effect was minimal. There is no reason to believe that the cyberspaces being designed at NASA or Florida will be any different. However, this knowledge does not seem to daunt the "real" cyberspace workers. Outside of their attention to the realities of the marketplace and workplace, the young, feisty engineers who do the bulk of the work on VR systems continue their discussions and arguments surrounding the nature and context of virtual environments. That these discussions already take place in a virtual environment--the great, sprawling international complex of commercial,

government, military, and academic computers known as Usenet--is in itself suggestive.

## Decoupling the Body and the Subject

The illusion will be so powerful you won't be able to tell what's real and what's not.

--Steve Williams

In her complex and provocative 1984 study *The Tremulous Private Body*, Frances Barker suggests that, because of the effects of the Restoration on the social and political imaginary in Britain (1660 and on), the human body gradually ceased to be perceived as public spectacle, as had previously been the case, and became privatized in new ways. In Barker's model of the post-Jacobean citizen, the social economy of the body became rearranged in such a way as to interpose several layers between the individual and public space. Concomitant with this removal of the body from a largely public social economy, Barker argues that the subject, the "I" or perceiving self that Descartes had recently pried loose from its former unity with the body, reorganized, or was reorganized, in a new economy of its own. In particular, the subject, as did the body, ceased to constitute itself as public spectacle and instead fled from the public sphere and constituted itself in text--such as Samuel Pepys' diary (1668).

Such changes in the social economy of both the body and the subject, Barker suggests, very smoothly serve the purposes of capital accumulation. The product of a privatized body and of a subject removed from the public sphere is a social monad more suited to manipulation by virtue of being more isolated. Barker also makes a case that the energies of the individual, which were previously absorbed in a complex public social economy and which regularly returned to nourish the sender, started backing up instead, and needing to find fresh outlets. The machineries of capitalism handily provided a new channel for productive energy. Without this damming of creative energies, Barker suggests, the industrial age, with its vast hunger for productive labor and the consequent creation of surplus value, would have been impossible.

In Barker's account, beginning in the 1600s in England, the body became progressively more hidden, first because of changing conventions of dress, later by conventions of spatial privacy. Concomitantly, the self, Barker's "subject," retreated even further inward, until much of its means of expression was through texts. Where social communication had been direct and personal, a warrant was developing for social communication to be indirect and delegated through communication technologies--first pen and paper, and later the technologies and market economics of print. The body (and the subject, although she doesn't lump them together in this way) became "the site of an operation of power, of an exercise of meaning . . . a transition, effected over a long period of time, from a socially visible object to one which can no longer be seen" (Barker 1984: 13).

While the subject in Barker's account became, in her words, "raging, solitary, productive," what it produced was text. On the other hand, it was the newly hidden Victorian body that became physically productive and that later provided the motor for the industrial revolution; it was most useful as a brute body, for which the creative spark was an impediment. In sum, the body became more physical, while the subject became more textual, which is to say nonphysical.

If the information age is an extension of the industrial age, with the passage of time the split between the body and the subject should grow more pronounced still. But in the fourth epoch the split is simultaneously growing and disappearing. The socioepistemic mechanism by which bodies mean is undergoing a deep restructuring in the latter part of the twentieth century, finally fulfilling the furthest extent of the isolation of those bodies through which its domination is authorized and secured.

I don't think it is accidental that one of the earliest, textual, virtual communities--the community of gentlemen assembled by Robert Boyle during his debates with Hobbes--came into existence at the moment about which Barker is writing. The debate between Boyle and Hobbes and the production of Pepys' diary are virtually contemporaneous. In the late twentieth century, Gibson's *Neuromancer* is simultaneously a perverse evocation of the Restoration subject and its annihilation in an implosion of meaning from which arises a new economy of signification.

Barker's work resonates in useful ways with two other accounts of the evolution of the body and the subject through the interventions of late twentieth-century technologies: Donna Haraway's "A Manifesto for Cyborgs" and "The Biopolitics of Postmodern Bodies" (1985, 1988). Both these accounts are about the collapse of categories and

of the boundaries of the body. (Shortly after being introduced to Haraway's work I wrote a very short paper called "Sex And Death among the Cyborgs." The thesis of "Sex And Death" was similar to Haraway's.) The boundaries between the subject, if not the body, and the "rest of the world" are undergoing a radical refiguration, brought about in part through the mediation of technology. Further, as Baudrillard and others have pointed out, the boundaries between technology and nature are themselves in the midst of a deep restructuring. This means that many of the usual analytical categories have become unreliable for making the useful distinctions between the biological and the technological, the natural and artificial, the human and mechanical, to which we have become accustomed.

François Dagognet suggests that the recent debates about whether nature is becoming irremediably technologized are based on a false dichotomy: namely that there exists, here and now, a category "nature" which is "over here," and a category "technology" (or, for those following other debates, "culture") which is "over there." Dagognet argues on the contrary that the category "nature" has not existed for thousands of years . . . not since the first humans deliberately planted gardens or discovered slash-and-burn farming. I would argue further that "Nature," instead of representing some pristine category or originary state of being, has taken on an entirely different function in late twentieth-century economies of meaning. Not only has the character of nature as yet another coconstruct of culture become more patent, but it has become nothing more (or less) than an ordering factor--a construct by means of which we attempt to keep technology visible as something separate from our "natural" selves and our everyday lives. In other words, the category "nature," rather than referring to any object or category in the world, is a strategy for maintaining boundaries for political and economic ends, and thus a way of making meaning. (In this sense, the project of reifying a "natural" state over and against a technologized "fallen" one is not only one of the industries of postmodern nostalgia, but also part of a binary, oppositional cognitive style that some maintain is part of our society's pervasively male epistemology.)

These arguments imply as a corollary that "technology," as we customarily think of it, does not exist either; that we must begin to rethink the category of technology as also one that exists only because of its imagined binary opposition to another category upon which it operates and in relation to which it is constituted. In a recent paper Paul Rabinow asks what kind of being might thrive in a world in which nature is becoming increasingly technologized. What about a being who has learned to live in a world in which, rather than nature becoming technologized, technology is nature--in which the boundaries between subject and environment have collapsed?

Phone sex workers and VR engineers. I have recently been conducting a study of two groups who seemed to instantiate productive aspects of this implosion of boundaries. One is phone sex workers. The other is computer scientists and engineers working on VR systems that involve making humans visible in the virtual space. I was interested in the ways in which these groups, which seem quite different, are similar. For the work of both is about representing the human body through limited communication channels, and both groups do this by coding cultural expectations as tokens of meaning.

Computer engineers seem fascinated by VR because you not only program a world, but in a real sense inhabit it. Because cyberspace worlds can be inhabited by communities, in the process of articulating a cyberspace system, engineers must model cognition and community; and because communities are inhabited by bodies, they must model bodies as well. While cheap and practical systems are years away, many workers are already hotly debating the form and character of the communities they believe will spring up in their quasi-imaginary cyberspaces. In doing so, they are articulating their own assumptions about bodies and sociality and projecting them onto the codes that define cyberspace systems. Since, for example, programmers create the codes by which VR is generated in interaction with workers in widely diverse fields, how these heterogeneous co-working groups understand cognition, community, and bodies will determine the nature of cognition, community, and bodies in VR.

Both the engineers and the sex workers are in the business of constructing tokens that are recognized as objects of desire. Phone sex is the process of provoking, satisfying, constructing desire through a single mode of communication, the telephone. In the process, participants draw on a repertoire of cultural codes to construct a scenario that compresses large amounts of information into a very small space. The worker verbally codes for gesture, appearance, and proclivity, and expresses these as tokens, sometimes in no more than a word. The client uncompresses the tokens and constructs a dense, complex interactional image. In these interactions desire appears as a product of the tension between embodied reality and the emptiness of the token, in the forces that maintain the preexisting codes by which the token is constituted. The client mobilizes expectations and preexisting codes for

body in the modalities that are not expressed in the token; that is, tokens in phone sex are purely verbal, and the client uses cues in the verbal token to construct a multimodal object of desire with attributes of shape, tactility, odor, etc. This act is thoroughly individual and interpretive; out of a highly compressed token of desire the client constitutes meaning that is dense, locally situated, and socially particular.

Bodies in cyberspace are also constituted by descriptive codes that "embody" expectations of appearance. Many of the engineers currently debating the form and nature of cyberspace are the young turks of computer engineering, men in their late teens and twenties, and they are preoccupied with the things with which postpubescent men have always been preoccupied. This rather steamy group will generate the codes and descriptors by which bodies in cyberspace are represented. Because of practical limitations, a certain amount of their discussion is concerned with data compression and tokenization. As with phone sex, cyberspace is a relatively narrow-bandwidth representational medium, visual and aural instead of purely aural to be sure, but how bodies are represented will involve how recognition works.

One of the most active sites for speculation about how recognition might work in cyberspace is the work of computer game developers, in particular the area known as interactive fantasy (IF). Since Gibson's first book burst onto the hackers' scene, interactive fantasy programmers (in particular, Laurel and others) have been taking their most durable stock-in-trade and speculating about how it will be deployed in virtual reality scenarios. For example, how, if they do, will people make love in cyberspace--a space in which everything, including bodies, exists as something close to a metaphor. Fortunately or unfortunately, however, everyone is still preorgasmic in virtual reality.

When I began the short history of virtual systems, I said that I wanted to use accounts of virtual communities as an entry point into a search for two things: an apparatus for the production of community and an apparatus for the production of body. Keeping in mind that this chapter is necessarily brief, let me look at the data so far:

- \* Members of electronic virtual communities act as if the community met in a physical public space. The number of times that on-line conferencees refer to the conference as an architectural place and to the mode of interaction in that place as being social is overwhelmingly high in proportion to those who do not. They say things like "This is a nice place to get together" or "This is a convenient place to meet."

- \* The virtual space is most frequently visualized as Cartesian. On-line conferencees tend to visualize the conference system as a three-dimensional space that can be mapped in terms of Cartesian coordinates, so that some branches of the conference are "higher up" and others "lower down." (One of the commands on the Stuart II conference moved the user "sideways.") Gibson's own visualization of cyberspace was Cartesian. In consideration of the imagination I sometimes see being brought to bear on virtual spaces, this odd fact invites further investigation.

- \* Conferencees act as if the virtual space were inhabited by bodies. Conferencees construct bodies on-line by describing them, either spontaneously or in response to questions, and articulate their discourses around this assumption.

- \* Bodies in virtual space have complex erotic components. Conferencees may flirt with each other. Some may engage in "netsex," constructing elaborate erotic mutual fantasies. Erotic possibilities for the virtual body are a significant part of the discussions of some of the groups designing cyberspace systems. The consequences of virtual bodies are considerable in the local frame, in that conferencees mobilize significant erotic tension in relation to their virtual bodies. In contrast to the conferences, the bandwidth for physicalities in phone sex is quite limited. (One worker said ironically, "(o)n the phone, every female sex worker is white, five feet four, and has red hair.")

- \* The meaning of locality and privacy is not settled. The field is rife with debates about the legal status of communications within the networks. One such, for example, is about the meaning of inside and outside. Traditionally, when sending a letter one preserves privacy by enclosing it in an envelope. But in electronic mail, for example, the address is part of the message. The distinction between inside and outside has been erased, and along with it the possibility of privacy. Secure encryption systems are needed.[2]

- \* Names are local labels. "Conferencees" seem to have no difficulty addressing, befriending, and developing fairly complex relationships with the delegated puppets--agents--of other conferencees. Such relationships remain stable

as long as the provisional name ("handle") attached to the puppet does not change, but an unexpected observation was that relationships remain stable when the conferencee decides to change handles, as long as fair notice is given. Occasionally a conferencee will have several handles on the same conference, and a constructed identity for each. Other conferencees may or may not be aware of this. Conferencees treat others' puppets as if they were embodied people meeting in a public space nonetheless.

#### Private Body, Public Body, and Cyborg Envy

Partly, my interest in VR engineers stems from observations that suggest that they while are surely engaged in saving the project of late twentieth- century capitalism, they are also inverting and disrupting its consequences for the body as object of power relationships. They manage both to preserve the privatized sphere of the individual-- which Barker characterizes as "raging, solitary, productive"--as well as to escape to a position that is of the spectacle and incontrovertibly public. But this occurs under a new definition of public and private: one in which warrantability is irrelevant, spectacle is plastic and negotiated, and desire no longer grounds itself in physicality. Under these conditions, one might ask, will the future inhabitants of cyberspace "catch " the engineers' societal imperative to construct desire in gendered, binary terms--coded into the virtual body descriptors--or will they find more appealing the possibilities of difference unconstrained by relationships of dominance and submission? Partly this will depend upon how "cyberspaceians" engage with the virtual body.

Vivian Sobchack, in her 1987 discussion of cinematic space excludes the space of the video and computer screen from participation in the production of an "apparatus of engagement." Sobchack describes engagement with cinematic space as producing a thickening of the present a "temporal simultaneity (that) also extends presence spatially--transforming the 'thin' abstracted space of the machine into a thickened and concrete world." Contrasted with video, which is to say with the electronic space of the CRT screen and with its small, low-resolution, and serial mode of display, the viewer of cinema engages with the apparatus of cinematic production in a way that produces "a space that is deep and textural, that can be materially inhabited . . . a specific and mobile engagement of embodied and enworlded subjects/ objects whose visual/visible activity prospects and articulates a shifting field of vision from a world that always exceeds it." Sobchack speaks of electronic space as "a phenomenological structure of sensual and psychological experience that seems to belong to no-body." Sobchack sees the computer screen as "spatially decentered, weakly temporalized and quasi-disembodied."

This seems to be true, as long as the mode of engagement remains that of spectator. But it is the quality of direct physical and kinesthetic engagement, the enrolling of hapticity in the service of both the drama and the dramatic, which is not part of the cinematic mode. The cinematic mode of engagement, like that of conventional theater, is mediated by two modalities; the viewer experiences the presentation through sight and hearing. The electronic screen is "flat," so long as we consider it in the same bimodal way. But it is the potential for interaction that is one of the things that distinguishes the computer from the cinematic mode, and that transforms the small, low-resolution, and frequently monochromatic electronic screen from a novelty to a powerfully gripping force. Interaction is the physical concretization of a desire to escape the flatness and merge into the created system. It is the sense in which the "spectator" is more than a participant, but becomes both participant in and creator of the simulation. In brief, it is the sense of unlimited power which the dis/embodied simulation produces, and the different ways in which socialization has led those always-embodied participants confronted with the sign of unlimited power to respond.

In quite different terms from the cinematic, then, cyberspace "thickens" the present, producing a space that is deep and textural, and one that, in Sobchack's terms, can be materially inhabited. David Tomas, in his article "The Technophilic Body" (1989), describes cyberspace as "a purely spectacular, kinesthetically exciting, and often dizzying sense of bodily freedom." I read this in the additional sense of freedom from the body, and in particular perhaps, freedom from the sense of loss of control that accompanies adolescent male embodiment. Cyberspace is surely also a concretization of the psychoanalytically framed desire of the male to achieve the "kinesthetically exciting, dizzying sense" of freedom.

Some fiction has been written about multimodal, experiential cinema. But the fictional apparatus surrounding imaginary cybernetic spaces seems to have proliferated and pushed experiential cinema into the background. This is because cyberspace is part of, not simply the medium for, the action. Sobchack, on the other hand, argues that cinematic space possesses a power of engagement that the electronic space cannot match:

Semiotically engaged as subjective and intentional, as presenting representation of the objective world . . . The

spectator(s) can share (and thereby to a degree interpretively alter) a film's presentation and representation of embodied experience. (Forthcoming)

Sobchack's argument for the viewer's intentional engagement of cinematic space, slightly modified, however, works equally well for the cybernetic space of the computer. That is, one might say that the console cowboy is also " . . . semiotically engaged as subjective and intentional, as presenting representation of a subjective world . . . the spectator can share (and thereby to a high degree interpretively alter) a simulation's presentation and representation of experience which may be, through cybernetic/semiotic operators not yet existent but present and active in fiction (the cyberspace deck), mapped back upon the physical body."

In psychoanalytic terms, for the young male, unlimited power first suggests the mother. The experience of unlimited power is both gendered, and, for the male, fraught with the need for control, producing an unresolvable need for reconciliation with an always absent structure of personality. An "absent structure of personality" is also another way of describing the peculiarly seductive character of the computer that Turkle characterizes as the "second self." Danger, the sense of threat as well as seductiveness that the computer can evoke, comes from both within and without. It derives from the complex interrelationships between human and computer, and thus partially within the human; and it exists quasi-autonomously within the simulation. It constitutes simultaneously the senses of erotic pleasure and of loss of control over the body. Both also constitute a constellation of responses to the simulation that deeply engage fear, desire, pleasure, and the need for domination, subjugation, and control.

It seems to be the engagement of the adolescent male within humans of both sexes that is responsible for the seductiveness of the cybernetic mode. There is also a protean quality about cybernetic interaction, a sense of physical as well as conceptual mutability that is implied in the sense of exciting, dizzying physical movement within purely conceptual space. I find that reality hackers experience a sense of longing for an embodied conceptual space like that which cyberspace suggests. This sense, which seems to accompany the desire to cross the human/machine boundary, to penetrate and merge, which is part of the evocation of cyberspace, and which shares certain conceptual and affective characteristics with numerous fictional evocations of the inarticulate longing of the male for the female, I characterize as cyborg envy.

Smoothness implies a seductive tactile quality that expresses one of the characteristics of cyborg envy: In the case of the computer, a desire literally to enter into such a discourse, to penetrate the smooth and relatively affectless surface of the electronic screen and enter the deep, complex, and tactile (individual) cybernetic space or (consensual) cyberspace within and beyond. Penetrating the screen involves a state change from the physical, biological space of the embodied viewer to the symbolic, metaphorical "consensual hallucination" of cyberspace; a space that is a locus of intense desire for refigured embodiment.

The act of programming a computer invokes a set of reading practices both in the literary and cultural sense. "Console cowboys" such as the cyberspace warriors of William Gibson's cyberpunk novels proliferate and capture the imagination of large groups of readers. Programming itself involves constant creation, interpretation, and reinterpretation of languages. To enter the discursive space of the program is to enter the space of a set of variables and operators to which the programmer assigns names. To enact naming is simultaneously to possess the power of, and to render harmless, the complex of desire and fear that charge the signifiers in such a discourse; to enact naming within the highly charged world of surfaces that is cyberspace is to appropriate the surfaces, to incorporate the surfaces into one's own. Penetration translates into envelopment. In other words, to enter cyberspace is to physically put on cyberspace. To become the cyborg, to put on the seductive and dangerous cybernetic space like a garment, is to put on the female. Thus cyberspace both disembodies, in Sobchack's terms, but also reembodies in the polychrome, hypersurfaced cyborg character of the console cowboy. As the charged, multigendered, hallucinatory space collapses onto the personal physicality of the console cowboy, the intense tactility associated with such a reconceived and refigured body constitutes the seductive quality of what one might call the cybernetic act.

In all, the unitary, bounded, safely warranted body constituted within the frame of bourgeois modernity is undergoing a gradual process of translation to the refigured and reinscribed embodiments of the cyberspace community. Sex in the age of the coding metaphor--absent bodies, absent reproduction, perhaps related to desire, but desire itself refigured in terms of bandwidth and internal difference--may mean something quite unexpected. Dying in the age of the coding metaphor--in selectably inhabitable structures of signification, absent warrantability--gives new and disturbing meaning to the title of Steven Levine's book about the process, *Who Dies?*

### Cyberspace, Sociotechnics, and Other Neologisms

Part of the problem of "going on in much the same way," as Harry Collins put it, is in knowing what the same way is. At the close of the twentieth century, I would argue that two of the problems are, first, as in Paul Virilio's analysis, speed, and second, tightly coupled to speed, what happens as human physical evolution falls further and further out of synchronization with human cultural evolution. The product of this growing tension between nature and culture is stress.