

Existential Technology: Wearable Computing Is Not the Real Issue!

Steve Mann

As our world becomes more and more globally connected, the official hierarchies of corporations and governments become larger and more complicated in scope, often making the chain of command and accountability more difficult for an individual person to question. Bureaucracies spanning several countries provide layers of abstraction and opacity to accountability for the functionaries involved in such official machinery. Thus, policy affecting our everyday life is moved further from our ability to influence, affect or even understand it. At the same time, the increased use of surveillance and monitoring technologies makes the individual more vulnerable to, and accountable to, these very organizations that are themselves becoming less accountable to the surveilled populace.

In this paper, I propose the concept of "Existential Technology" as the technology of self-determination and mastery over our own destiny, and I provide several examples of in(ter)ventions (new inventions I filed with the Patent Office as well as new interventions). In this article I deliberately conflate the terms invention and intervention, as I did in my recent exhibit at Gallery TPW, *Prior Art: Art of Record* [1]. (The terms "Prior Art" and "Art of Record" are commonly used in patent law.)

My performances and in(ter)ventions attempt to reflect the technological hypocrisies of large bureaucratic organizations on a moralistic (or humanistic) level by way of firsthand encounters with low-level "clerks," rather than the more traditional approach of writing letters to management, politicians or the like. By mirroring the structures of bureaucracy and complexity, I engage in a Reflectionist approach that I have found is, in many situations, surprisingly far more successful than writing letters to high-level officials [2].

Ironically, Existential Technology serves to empower the individual by disempowering the individual of responsibility for his or her own actions. Empowerment is achieved through self-demotion (e.g. assuming a low rank in the corporate hierarchy of a subservience

services corporation such as the Existential Technology Corporation). In the same way that large "governments" (convergence of multiple governments corrupted by interests of global corporations) are empowered by being less accountable for their actions, existential technologies allow individuals to self-bureaucratize in order to achieve a balance of bureaucracy when dealing with government organizations.

Existentialist theory holds that individuals are entirely free, thus entirely responsible. Clerks and functionaries, however, are not free, or at least can allege to be not free, and thus, ironically, are in some ways more free to escape responsibility or accountability for their actions. In the existentialist tradition, my apparatus of computer-mediated reality (e.g. wearing a computer and living in a computer-generated world) suggests the absurdity of reality that is so much a part of existentialist thinking [3].

Existentialism is not a philosophy but a label for several widely different revolts against traditional philosophy. The refusal to belong to any school of thought and a marked dissat-

ABSTRACT

The author presents "Existential Technology" as a new category of in(ter)ventions and as a new theoretical framework for understanding privacy and identity. His thesis is twofold: (1) The unprotected individual has lost ground to invasive surveillance technologies and complex global organizations that undermine the humanistic property of the individual; (2) A way for the individual to be free and collegially assertive in such a world is to be "bound to freedom" by an articulably external force. To that end, the author explores empowerment via self-demotion. He has founded a federally incorporated company and appointed himself to a low enough position to be bound to freedom within that company. His performances and in(ter)ventions over the last 30 years have led him to an understanding of such concepts as individual self-corporatization and submissivity reciprocity for the creation of a balance of bureaucracy.

Fig. 1. Installation of *SeatSale: Seating Made Simple*, at the San Francisco Art Institute, 2001. (© Steve Mann)



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isfaction with traditional philosophy as superficial form the heart of existentialism [4]. Thus, in formulating the concept of Existential Technology, I deliberately try to avoid making it too clear upon exactly whose shoulders I am standing, yet in so doing, I follow the (existentialist) tradition of not following a tradition.

The true spirit of much of existentialism includes many of the great moral questions raised in response to the rise of totalitarian government regimes [5].

Ordinarily it is said that “necessity is the mother of invention.” In other words, there is first an “essence” (abstract idea, a need); later, invention brings it into “existence” (reduction to practice). However, I more often find myself inventing something from within my own heart, not to satisfy any specific known need. Only later, after reduction to practice, when I begin using the apparatus of my inventions, do I discover their meaning. For example, after wearing a computer for more than 20 years, I am only now beginning to understand what it all means and why I came up with what at the time seemed to others to be a totally useless invention.

I refer to these inventions, where their existence (reduction to practice) precedes their essence, as “Existential Technology.”

I begin by describing some of my “cyborg” in(ter)ventions over the past 30 years, during which I invented, designed and built experimental apparatuses for various experiments, which were also performances. My experimental subjects were often drawn from the following groups:

- gambling casino owners
- security guards at gambling casinos
- security guards in department stores where video surveillance was being used extensively
- customs officials
- other officials involved in placing our society under surveillance and who were fearful of being placed under surveillance themselves.

I then summarize, within a theoretical framework, what I have learned from these in(ter)ventions.

SEATSALE

The over-protection of intellectual “property” has emerged as a situation that could threaten scholarly discourse, computer science and fair use.

Take, for example, the “purchase” of a typical computer or computer program.

What we now often have is a change from what might once have been a purchase into a license. I addressed the complexity of this paradigm shift in a recent traveling art installation entitled *SeatSale: Seating Made Simple*, in which a simple object, a chair, was connected to a global computer network with a license manager. Rather than owning the chair, the user licenses the use of the chair. Sliding a credit card through a slot in the chair causes 23 seat spikes to retract, for the duration of the “Seating License™” [6] (Fig. 1).

The complicated array of computers, servers and other equipment in the 19-in relay rack (“License Manager,” “License Server,” etc.) is juxtaposed with the corporate slogan “Seating Made Simple.” Downloading a “Free Seating License™” causes the solenoid-activated seat spikes to retract for a certain time period. The word “free” is used with jest, in the sense that although there is zero monetary cost (the credit card is for “identification purposes only”), the true cost is the loss of privacy and the loss of freedom to sit without asking for permission from a global Seating Services™ provider.

The point of *SeatSale* was to show how the protection of “Intellectual Property” violates something one might call the right of “Humanistic Property” [7].

CONSENSUS TACTICS: OUIJAGREE AS CONSENSUAL DISSENT

Shortly after *SeatSale*, I created a performance piece called *Ouijagree*. On Friday, 5 January 2001, at 18:12:34 EST, I plugged in a new computer for the first time. Like many new computers, it had been “tagged” with unsolicited advertising, including a sticker reading “Designed for Microsoft Windows 2000.” I wondered how this corporate tag was any different from graffiti that kids use to tag their gang’s territory. The computer also seemed to have been tagged internally with some unsolicited advertising as well, because a software message popped up on the screen indicating Terms and Conditions, which I certainly did not agree with. (I had not asked for any software for this computer since I ordinarily use only open-source software such as GNU Linux.) Among other things, the Terms and Conditions forbid the practice of science (e.g. trying to understand how a program works, its underlying operational principles, etc.). So, having three students (Ryan V. Fung, Ashish J. Khisti and Meghala H. Varia) working with me

on the computer, the four of us placed our hands gently on the mouse, to position the cursor wherever it was summoned to go.

Ouijagree contained elements of “Oui” (French for “yes,” as in “yes, we agree”) and of the Ouija board’s planchette. The mouse assumed the role of the latter. On the abstract level, we might say that the spirits of the dead are bound by the Terms and Conditions of the contract, whereas on the more concrete level, since no one particular one of us moved the mouse, it would be difficult to discern which of us, if any, were to be bound by these unfair and outrageous Terms and Conditions.

The *Ouijagree* performance was a very simple example of what I call Existential Technology (technology of self-determination and mastery over our own destiny). Ironically, our mastery over our own destiny (our freedom) came from our very lack of control over the situation (i.e. the fact that no one person exercised decisive voluntary control over the position of the planchette mouse).

The Ouija board is an appropriate metaphor for my “community of cyborgs,” because it complicates the locus of control. In the same way that a government’s firing squad may include some unloaded guns, the *Ouijagree* piece reflects a similar diffusion of responsibility. For example, a large community of online users could remotely operate a global Ouija board to write a program to convert Proprietary Data Format (PDF) documents to plain text for accessibility to the blind or visually impaired. Adobe (purveyors of PDF) would then have a hard time knowing whom to prosecute.

MY MANAGER: PLEASE WAIT FOR MY NEXT AVAILABLE MOMENT

In a mid-1970s performance I connected my body to electricity to stimulate body movement. Much like the planchette in *Ouijagree*, the *My Manager* performance allowed me to corporatize my body. Indeed, just as a corporation is an abstract entity, my body became an abstract entity, writhing in movement beyond my own control.

My Manager also evolved into other pieces that explored the freedom associated with covering, restraining and diminishing the capabilities of the human body, using such works as *PleaseWait* [8] (Fig. 2) and *Sight License* (Color Plate A No. 1), which prevented me from seeing or hearing anything until a person iden-

tified themselves by sliding an ID card through a slot on my head.

PleaseWait bears some similarity to Eduardo Kac's *Telepresence Garment* [9].

WEARCAM

A more recent series of performances, from the mid-1980s to the present, involved wearing photographic apparatus to create an incidentalist intervention. In such apparatus, intentionality can be conveniently obscured. For example, my telematic body in *Wearable Wireless Webcam* (a live performance transmitting continuously on the Web from 1994 to 1996) allowed other people (not me) to initiate a picture-capture process, and in some cases remotely teleoperate my body. When asked by security guards or department store staff if I was taking pictures, I could respond with uncertainty and consensus tactics, e.g. I was not knowingly taking pictures of anyone and I would need to check with my managers (thousands of other people I did not even know) in order to determine whether or not pictures were being remotely acquired [10]. Questioning and deconstructing rules becomes a new art form [11].

PLAYING IN THE KEY OF LOST

In the making of the film *Cyberman*, a film crew followed me through various day-to-day life activities, e.g. my visit to Casino Niagara on Sunday, 2 July 2000.

For shooting my documentary video (upon which the above was based) I used my EyeTap system—eyeglasses that cause the eye itself to function as if it were a camera. My wearable apparatus is controlled by a handpiece that looks (and works) much like a musical instrument. This “keyer” [12] has various keys that can be pressed in various combinations to form various chords. I unplugged my keyer so that I would have no control over my EyeTap rig, but before I unplugged it, I asked my wife to MAYBE press C, so that I would not know whether or not my eyeglasses were remembering (or recording or transmitting) anything. The keyer, which works like a musical instrument that I usually start off by playing in the key of G (Grab), then change to the key of C (Capture), was now removed so that I had no way of controlling the function of the apparatus or of knowing whether or not I was in the key of C.

Finally, I switched to the key of Lost: I locked my waist-worn computer rig shut with a small padlock for which I did not have a key. (I gave the key to my manager

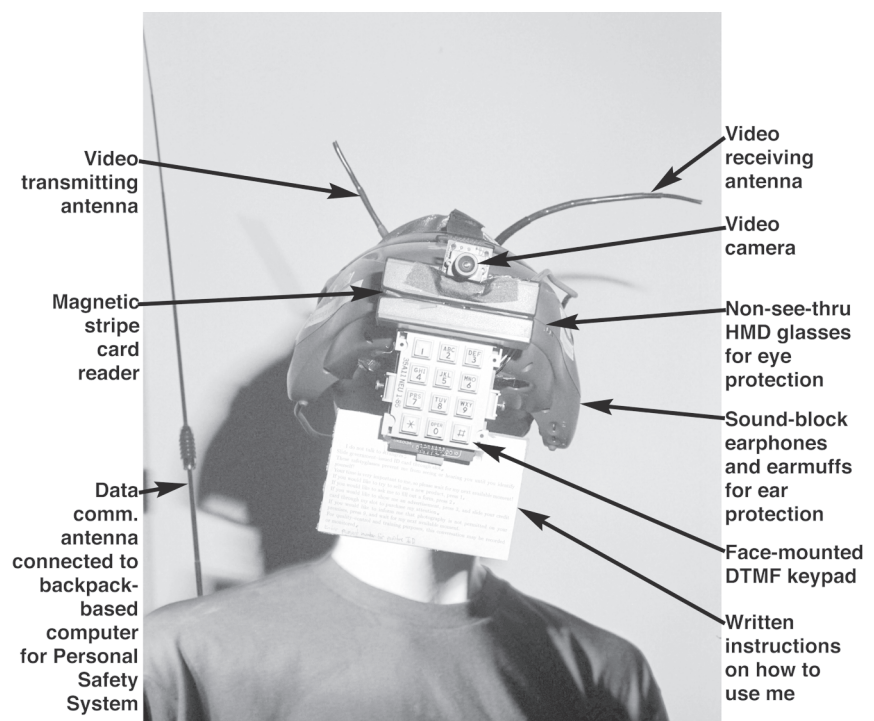


Fig. 2. *PleaseWait* (1–6 June, 1998): I don’t talk to strangers. Therefore you must slide a government-issued photo ID card through the slot on my head before I can see or hear you (or acknowledge your existence). If you would like to show me an advertisement, press 3 and slide your credit card through the slot on my head to purchase my attention (otherwise I cannot see your billboards or other ads). (© Steve Mann)

so that I would not have it.) Thus, I could not access any of the controls or determine whether or not the system was in Capture mode.

Now once I was MAYBE playing in the key of C, but definitely playing in the key of Lost, I wandered into the casino, with the film crew following.

The film crew managed to sneak in all their film gear (this was not merely video, but included a large Arriflex motion picture camera that shot real celluloid film). The line producer (Alexi Steele) distracted the guard, while the cameraman (Rudy) pretended to be close friends with his assistant, giving her a big hug, with the camera hidden between them, as they walked in past the guards. The sound crew also managed to sneak in past the guards, and so as I walked in, the crew quickly assembled inside and followed me up the escalator. There was a tall escalator going up a very grand entrance, and the crew knew that they could not be attacked in the confined space of the escalator, so that even after detection, any assailants would need to wait until the crew got to the top.

The assailants were waiting at the top.

The film crew explained that they were making a documentary of me (that they had been following me around, in my day-to-day life, etc.), but the crew was

asked not to take pictures, so I continued to wander around and make my own documentary. Nobody seemed to know that I *might* be playing in the key of C.

Later, I left and met up with the film crew who were waiting outside, having been prohibited from shooting inside the casino.

Casinos have traditionally been associated with money-laundering and crime, so that shooting video within casinos raises some interesting questions as to what is prohibited and what is allowed (e.g. the question as to whether photography is often prohibited in order to hide evidence of wrongdoing by the casino owners).

HEARTCAM

HeartCam was a bra made using two surveillance domes as cups, with a heart monitor in the left cup to trigger image capture; the apparatus took pictures when the heart beat faster (Fig. 3). *HeartCam* turned the tables on the “male gaze” by allowing the female wearer of the apparatus to capture images; at the same time it used heart rate as a natural index to frame rate (i.e. frame rate was proportional to the wearer’s degree of arousal).

Because image capture was involuntarily controlled by the wearer (heart rate



Fig. 3. HeartCam (2001) reverses the “male gaze” with a heart-triggered camera system conspicuously concealed in the left bra cup together with an infrared night vision camera and computer processor. HeartCam further includes a second high-resolution color camera in the right cup. (© Steve Mann)

being an externality not directly under her intended control), the apparatus provided an incidental element [13]. Moreover, if an assailant objected to the camera, or the possibility of a camera, by assailing the wearer, whether verbally or otherwise, the frame rate would increase.

Thus, a potential perpetrator who became upset at the wearer for photographing him would cause her heart to beat faster, which would cause her to take more pictures of him.

Since this feedback loop was beyond her control, it could be said that the assailant was taking pictures of himself by agitating her.

GRIEFCASE: MY BRIEFCASE CAN BE OPENED BY ANYONE OTHER THAN ME

Finally, I should emphasize that not all Existential Technology need be wearable. Although wearability is closely correlated to existentiality, there are examples, such as handcuffs, of wearable technologies that are not very existential in the context of their ordinary usage. There are also examples of non-wearable technologies that are very empowering (in the context of personal empowerment). One such example is a briefcase that can be opened by anyone other than myself (Fig. 4). Even though I built it, I cannot open it, because I have replaced the thumb-operated latches with fingerprint

scanners. A computer inside the case matches the fingerprints against a database, and I have simply put myself in the /etc/deny directory.

The *Griefcase* bears these written instructions on its exterior surface:

This briefcase is property of EXISTech Corp. By extension, it is thus considered to be part of EXISTech’s corporate head-

quarters. Therefore, it requires the same degree of protection as EXISTech’s Corporate Headquarters, namely that it be protected from undocumented access to its contents, or to access by strangers.

Accordingly, an audit trail log, with fingerprints of anyone and everyone opening this briefcase, whether for business, or simply for routine inspection, must be maintained.

Routine inspection may include inspection by officials, such as law-enforcement personnel, customs officials, etc., as well as by private security officers such as those stationed at the egress of establishments such as department stores, public libraries, and other places where bags and personal belongings are checked upon exiting or entering these establishments.

In order to ensure this accountability, the owner or person carrying this briefcase cannot open it. Only persons other than the owner of this briefcase can open it.

Anyone opening this briefcase, whether they be law enforcement officers, customs officials, military police, or private security forces, must therefore be fingerprinted, and the fingerprints must be maintained in a time-stamped accountability archive. Additionally, this briefcase contains a video surveillance system to document any inspection of its contents, in order to ensure that the contents are not compromised by strangers or corruption.

Compliance with these directives is enforced by both policy as well as by using the latest in keyless lock security technology. The briefcase uses keyless thumb latches activated by pressing both thumbs on the latches simultaneously. The onboard microprocessor scans the thumbprints of the person attempting to open the briefcase. If the fingerprints are

Fig. 4. An official is fingerprinted at an exhibit of the *Griefcase*, Wednesday, 1 November 2000. (© Steve Mann) A large number of government officials, including Canadian Security Intelligence Service (CSIS) officials, were fingerprinted with the *Griefcase*.



those of the owner, the briefcase is not opened. If the fingerprints are those of any person other than the owner, the fingerprints are transmitted by way of a built in cellular telephone data communications system, for remote archiving and comparison with a database of known criminals. Assuming no criminal match is found, the briefcase can be opened by anyone other than its owner, pending successful transmission and archiving of that person's fingerprints to a logfile mirrored across EXISTech's global network of servers.

As Assistant Mailroom Clerk for EXISTech Corporation, my job is simply to deliver the mail, and I, of course, cannot be trusted with access to the mail. Therefore, I cannot open the *Griefcase*.

This situation creates something I call Submissivity Reciprocity. That means that anyone wishing me to submit to a search of the case must submit to being fingerprinted.

Additionally, by handcuffing one of my hands to the case, and leaving the key in EXISTech's level 4 laboratory (or inside the briefcase itself), I am unable even to try to open the case, because I cannot get both thumbs onto the scanners at the same time. Thus, I require the help of the person wishing the case to be opened [14].

SUMMARY: HUMANS BEING CLERKS CAN MAKE CLERKS BE HUMAN

The fundamental problem that the individual faces when interacting with the ever-increasing scope of larger and larger global bureaucracies is that of imbalance and asymmetry.

Figure 5 illustrates this imbalance by way of an individual interacting with a clerk who either is, or pretends to be, under the control of a manager who either is, or pretends to be, under the control of a chief technology officer, who either is, or pretends to be, under the control of a board of directors, etc. For example, the CLERK may be protected by a surveillance camera or by a conspicuously covert container for a surveillance camera (such as a large Plexiglas hemispherical dome of wine-dark opacity). If the INDIVIDUAL complains about the surveillance or about the potential for surveillance (e.g. by asking about Plexiglas hemispherical domes of wine-dark opacity within the establishment), the CLERK either can claim not to know what is in the domes or can absolve himself or herself from responsibility for the situation by making

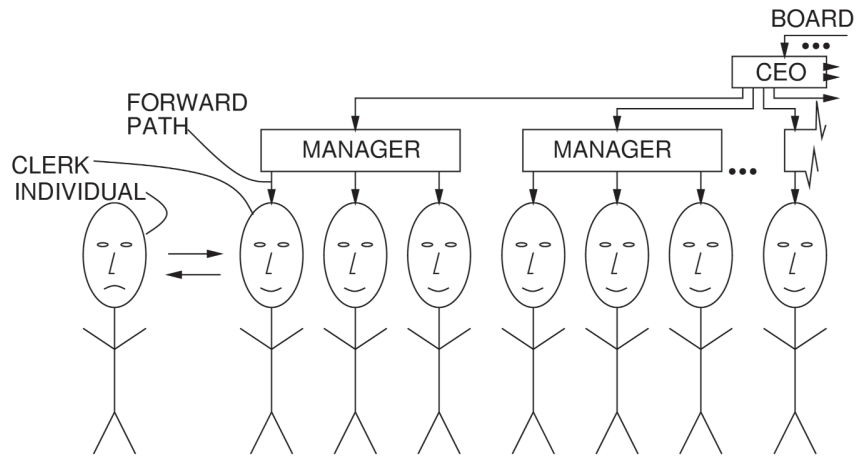


Fig. 5. An individual vs. a clerk under the control of a manager under control of a CEO under control of a board. . . . (© Steve Mann)

reference to the MANAGER. The CLERK can either claim that the MANAGER installed the surveillance cameras—or authorized or required the installation of the cameras—or that the MANAGER decides whether or not images are captured from these domes. Alternatively, the CLERK can completely deny knowing whether or not the domes actually contain cameras. Similarly, the MANAGER is bound by, or can pretend to be bound by, conditions from a chief executive officer (CEO). The CEO is bound by, or pretends to be bound by what the insurance company requires, or by a board of directors, denoted BOARD.

A typical example of such a situation is when an individual attempts to negotiate with a used-car salesman, and the used-car salesman might say something like, "I'd love to give you the car for two thousand dollars; let me check with my manager." The used car salesman then disappears into a back room, alone, has some coffee and reads a newspaper for a few minutes and then comes out and says, "I'd love to give you the car for two thousand dollars but my manager won't let me." Although the salesman never talked to a manager, the salesman has some degree of power over the customer by virtue of being able to credibly pretend that he is bound by a higher and unquestionable authority. A credible, articulable, higher and unquestionable authority allows representatives of organizations to obtain external blame and excuses for what would otherwise be irrational or disagreeable actions.

Unfortunately, the individual person does not ordinarily enjoy the same luxury as the clerk and must therefore behave more rationally, or risk seeming

irrational, rude or otherwise inappropriate.

Another example is that of video surveillance. If we visited a friend's house where video surveillance was used because that person did not trust us, we would likely be quite angry. However, we often accept the use of video surveillance systems by owners of large organizations, simply because it is not clear who is responsible for the installation of such systems. In my *ShootingBack* performance [15] I explored this phenomenon, by asking clerks at department stores, and the like, why they had placed me under video surveillance. Their typical response externalized the responsibility to some higher and unquestionable authority such as management. When I attempted to follow the chain of responsibility upwards, management indicated the directive was from head office, and head office argued video surveillance was just policy, or for insurance purposes or the like. Thus, there was no clear accountability for the situation.

If an individual carried a handheld video camera around, videotaping clerks, casino operators, police officers, customs officials and the like, the individual might be regarded as strange, rude or otherwise acting in an inappropriate manner.

The individual could rely on religion as a manager, by, for example, wearing a camera contraption as part of a religious order. Just as religion allows individuals the right to wear special headwear even as uniformed employees (e.g. to wrap their heads in various materials that would otherwise be regarded as inappropriate), a new religion such as the "personal safety religion" could be in-

ment usually brings me face-to-face with their highest official much faster than trying to approach the official myself (as in Michael Moore's *Roger and Me*). By demoting myself to a low-level clerk in my own self-inflicted bureaucracy, I create a situation that the clerks cannot deal with, so they bring me their managers right away. I do not need to write endless unanswered letters and wait for hours on hold. I mirror the organization upon itself to get them to bring me their top official very quickly. S. Mann, "'Reflectionism' and 'Diffusionism': New Tactics for Deconstructing the Video Surveillance Superhighway," *Leonardo* 31, No. 2, 93–102 (1998); <<http://wearcam.org/leonardo/index.htm>>.

3. Albert Camus, a writer who worked for the French resistance movement against the Germans in World War II and co-edited with Jean-Paul Sartre a newspaper called *Combat*, also examined civilization's failure to properly address many serious moral issues. See also the many writings by Camus and others on the "Theater of the Absurd."

4. Walter Kaufmann, *Existentialism from Dostoevsky to Sartre* (World Publishing Company, 1956). See also <<http://www.interchange.ubc.ca/cree/kaufmann.htm>>.

5. See, for example, Viktor Frankl, "From Death Camp to Existentialism" (Boston, MA: Beacon Press, 1959).

6. See <<http://wearcam.org/seatsale/index.htm>> for more details on the actual exhibits.

7. The concept of Humanistic Property is described in Steve Mann, "Computer Architectures for Protection of Personal Informatic Property," *First Monday* 5, No. 7 (July 2000); <http://firstmonday.org/issues/issue5_7/mann/index.html>.

8. See <<http://wearcam.org/pleasewait.htm>>.

9. "Instead of adorning or expanding the body, however, the Telepresence Garment . . . foregrounds the other meanings of the verb 'to wear': To damage, diminish, erode, or consume by long or hard use; to fatigue, weary, or exhaust." Eduardo Kac, "Dialogi-

cal Telepresence Art and Net Ecology," in Ken Goldberg, ed., *The Robot in the Garden: Telerobotics and Telepresence in the Age of the Internet* (Cambridge, MA: MIT Press, 2000) pp. 180–196; <<http://www.ekac.org/dialelep.html>>.

10. Wearable Wireless Webcam, as described in <<http://wearcam.org>> and <<http://wearcam.org/art.htm>>. Beginning in 1994 (and at that time only known to my close friends and relatives) the site exploded in popularity. Eventually, on 22 February 1995, this site was chosen as "Cool Site of the Day" by what was then the world's most popular Web portal. At the end of the day I accidentally documented a fire at MIT's East Campus <http://wearcam.org/previous_experiences/eastcampusfire.html>, serendipitously creating a new kind of journalism. Part of my reason for doing this was also to raise issues about privacy and surveillance, which it certainly did. See, for example, <http://wearcam.org/anders_hove_wearable_web_camera_goes_too_far.htm> (criticism of my using my invention as a "complete substitute for existence").

11. Artists are beginning to ask questions about rules and regulations, and even about crime and what crime is, for example, as articulated by Stephen Wilson: "Deconstructing Crime: What's a crime? Who defines it? What are our prejudices about crime? Are street crimes worthy of more attention than other crimes against the community such as poisoning the Bay or creation of dangerous products that kill or maim?" <http://userwww.sfsu.edu/~netart/crimezy/crime_main.html>; see also <<http://www.ctheory.com/article/a067.html>>.

Julia Scher also provides a critical framework in which to understand such concepts as what she calls INTERFACE DISEASE SQUADRONS; MAN TRAP BOOTHS; and QUARANTINE BLOCKS. See <<http://www.insecuritybyjulia.com>>.

My recent exhibit on mass decontamination also looks at similar issues. See <http://wearcam.org/tpw_decon_drill/index.htm>.

12. See <<http://wearcam.org/septambic/index.html>> and <<http://about.eyetap.org/library/weekly/aa120400a.shtml>>.

13. By incidentalism, I mean that there is no appearance of deliberate action. For example, *Heart-Cam*, like the other *WearCam* inventions, creates a possibility for image capture by mere chance, seemingly without intention, as opposed to the situation with a traditional camera that needs to be held up to the eye.

14. A smaller wallet-sized version of a similar apparatus is described at <<http://wearcam.org/griefcase/idwallet.htm>>.

15. See <<http://wearcam.org/shootingback.html>>, as well as some of the movies at <<http://wearcam.org/shootingback/>>.

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*Steve Mann has lived as a cyborg for 30 years, creating live street performances. Although his work has been exhibited at the Museum of Modern Art in New York, Stedelijk Museum of Art in Amsterdam, Science Museum in the U.K. and various other museums around the world, he believes that the artifacts of the museums are little more than the residue left over from a live performance. Therefore, as a satire of the art gallery, he has constructed a wearable art gallery in which anyone can exhibit work. He now works as an assistant filing clerk trainee in the self-constructed gallery (as described in his book *Cyborg: Digital Destiny and Human Possibility in the Age of the Wearable Computer [Doubleday, 2001]*), written with Hal Niedzviecki.*