THE BODY AS PASSWORD: BIOMETRICS AND CORPOREAL DISPOSSESSION[1]

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"Information has become a technoscientific concept and conceptualized as distinct from the physical markers that embody it." (Katherine Hayles quoted in Schoder & Crandell 2001, pp. 16-17)

Introduction

Since the 11th of September, 2001 and its series of terrorist attacks in the United States, forms of corporeal recognition and identification have gained renewed acceptance within state, corporate, and even civilian structures and populations. This is the realm of Biometrics, systems of automatic identity recognition and authentication based upon unique physiological characteristics such as facial features, fingerprint designs, hand configurations and voice patterns. The current "war on terrorism" has bolstered the production of established biometric technologies, accelerated related research, and advanced the widespread use of its devices. It has also considerably legitimated the further development of similarly intrusive technologies that extend their reach into the once private realms of bodily authority and corporeal identity.

In addition to current geopolitical security concerns, the substantial expansion of the biometrics industry has been nourished by several other key factors. Firstly, the rapid growth of information and interaction technologies over the last decade has stimulated the tendency to shift away from directly physical forms of communication to increasingly disembodied states separate from physiological presence. Simultaneously, everyday life has increasingly become subject to organised scrutiny, both as a feature of new technological capabilities and as a matter of changed public policies at every level of opera-

[1] Note: Electronic articles and other texts are incorporated into the footnotes rather than listed in the bibliography.

tion. The development of increasingly sophisticated and remotely operated sensors – combined with a growing need for data protection – have contributed greatly to a flourishing surveillance culture whose installation in the public psyche has been as sure as it has been surreptitious. Not least, this combination of circumstances has encouraged the technological separation of corporeal identity from personal bases of knowledge and control in much the same way that biomedical technologies have re(produced) bodily selves through various forms of digital visualisation (Czeglédy & Czeglédy 2000a, 2000b, 2000c, 2001).

Additionally, affordable computer capabilities and technical enhancement possibilities have allowed for the means to collect and sort, store and circulate, retrieve and market, data with a formerly unimaginable precision and on a previously undreamed of scale. In the process of establishing giant information databases, the private corporeal body has become a key source and site for collecting and distributing information. At the same time, its various readings have become an issue of publicly traded, commercial property that disrupts – if not overturns – the traditional bases of self-knowledge.

The increased availability and use of biometric devices revives the classic man/machine dichotomy that has revolved around all considerations of technology over time. How does the redefined Digital Persona affect individual identity? How can the appropriate utilisation of biometric devices be evaluated? Are the fervently promoted appliances always used for the protection of society? Could the resultant "profiles" be misappropriated and potentially lead to the criminalisation of harmless individuals? These and similar questions all have relevance for understanding the rapidly changing interplays between technology, bodily identity, and structures of power in society. In the intricate loop between man and machine, is encoding (and its resultant process of disembodiment) only the first link in a longer chain, a prelude to further events, or is it a new stage in societal evolution that will free us from the limitations of time, space, and even our own bodies? The primary goal of this text is to investigate the displacement of the human body through information technology-mediated surveillance techniques, and to present artistic interpretations of the man/machine interface. Special attention will be paid to the ideas of N. Katherine Hayles and Eugene Thacker, both of whom have closely addressed many of the salient issues related to biometrics. In addition, we will consider some of the aesthetic commentaries of contemporary artists such as Steve Mann, Seiko Mikami and Eduardo Kac, who have each directly engaged with, and challenged, the changing relationship between human beings and their technology.

The Posthuman Condition

In our freshly computerised (Western) universe, everything from genetics through physics to astronomy becomes abstract information in the interests of scientific rationalisation: a code.

A code without a body, shifted from the physical to the immaterial in the depths of cyberspace – a digital representation of the "real substance" of life. In the process of encoding (and decoding) the body, previous corporeal associations have changed, and a loss of individual identity has occurred with the development of new cyborgean potentials. In a recent interview with Albert Borgmann, Katherine Hayles noted that "both artificial and human intelligences are being reconceptualized in ways that facilitate their interactions with one another."[2] Her statement underlines the various ways in which over the last fifty years the cyborg has emerged as an increasingly real technological and cultural construct, a vision of the near future far closer to realistic fruition than many would like to think. In a manner of thinking, it is nothing less than what might be better understood as the "posthuman condition" (Hayles 1999), a dissolution of boundaries that was once only the stuff of science fiction dramas.

While the consideration of cyborgean issues is inevitable when exploring the computerised universe, for our current purposes we will focus on the coding and decoding process of the digitised body and its further social/cultural ramifications. In order to evaluate this process and its impacts, some of the biometric devices (and the industry producing them) need first to be reviewed in brief.

The Biometrics Industry

Aspects of the "communication revolution" have been heralded as triumphal elements in the emancipating conquest of technology over the drudgery of physical labour. This near messianic perspective has encouraged its adherents to relish the prospects of instant, trouble-free, sophisticated (and incorporeal) forms of interaction that are far removed from the traditional norms of physical simultaneity. While this so-called victory remains highly debatable from the point of view of access at the very least (and misuse at the worst), the benign version of its image has found quick acceptance in an astonishing diversity of public fora of late.

[2] http://www.press.uchicago.edu/Misc/Chicago/borghayi.html

Under the auspices of technically aided improvements to wider societal functioning, the successful promotion of such ideas has provided ancillary sectors of commerce (such as biometrics equipment development and manufacturing) a fertile terrain for both public research, and private venture capital, funding. In addition, the biometrics industry has adroitly utilised the heightened concerns for private and public safety in order to promote its products to security conscious international organizations, law enforcement agencies, and corporate as well as individual clients. Is everyone a potential customer? In our increasingly institutionalised existence, will we have a choice?

The contemporary attraction of biometrics technologies has a much broader market potential than one might sceptically assume given the quickly changing, and essentially transient, nature of geopolitical concerns ballooned by a variety of electoral imperatives. A pair of continuing issues for any new such technological arena remains the expansion of market scope and the development of multiple levels of customer accessibility. In this regard, the prices of various biometric devices have substantially decreased in recent years due to technological advances in their manufacturing. This condition has lead to substantially lower customer entry levels while changing wider notions of affordability. Along with the development of improved operating efficiency values (as biometric technologies are continually refined), it promises new points of affordable product access for a growing pool of prospective customers. Even prior to the autumn of 2001, the expected growth rate of the biometrics industry was estimated to lie between 30 and 40% per annum (Millman 2000). Now, with the added pressure of political imperatives, such predictions seem conservative.

The private sector is, however, only one side of a far wider biometrics industry. A level of co-ordination between private interests and public sector research, development and application has existed in the United States for at least the last decade, ever since the establishment of the Biometric Consortium in 1992.[3] The Consortium's participants include federal security and law enforcement agencies, national research laboratories, federally-funded technology corporations, university research institutes, the military services and a wide variety of other parties. Its main function is to encourage the research, development, testing and evaluation of identification/verification technologies.

The events of September 2001 have further encouraged increased involvement by the government in the biometrics industry, partly in the supposed interests of national security, and partly in the more conventional in-

[3] The US Federal Government in 1995 formally approved the Biometric Consortium.

terests of scientific regulation and commercial control. It is, therefore, not surprising that the Chairman of the House Science Committee recently announced his expectation to receive "greater attention" for government research initiatives connected with identification technologies (Leopold 2001). Such attention is increasingly likely to pool in a limited number of science/technology sectors, with the field of biometrics being substantially represented through the previously established Biometrics Research Programme (BRP) and its mission "devoted to understanding physiological correlates of cognition in individuals with and without psychopathology."[4]

The BRP involves a wide spectrum of activities ranging from the testing of standardised databases to facilitating conferences and publications, and providing access to information on the Internet. Irrespective of the outcomes of the BRP, it is already clear that specific biometrics technologies – each with its own proprietary device(s) – are leading the way in establishing new forms of identity recognition. Key applications already developed by American and international agencies, institutes and companies often focus on either authentication or access to computer systems containing sensitive information or physical access control to secure spaces. Nevertheless, spin-off scenarios just as readily call for military applications: some of the most sophisticated surveillance and reconnaissance innovations currently used include unmanned aerial vehicles (UAV) in Afghanistan, for example. UAVs such as General Atomic Corporation's *Predator* and Grumman Aerospace's *Global Hawk*, have been used in a variety of ways to support C4ISR missions gathering enemy information, designating targets for air strikes and collecting information for battle damage assessment (Keeter 2001). It is, however, in the more mainstream application of civilian life that biometric devices will soon demonstrate their greatest impact.

Biometric Devices

Currently used biometric devices measure and calibrate specific physiological attributes of the human body. They tend to focus on specific parts of the body and, in a form of double reinforcement, specific features of its corporeal structure. As a direct consequence, we now encounter an increasing variety of biometric technologies that produce a corresponding plurality of bodily images or profiles depending upon their accuracy and/or the nature of their visualisation procedures. In a very real sense, these images/profiles

[4] http://www.wpic.pitt.edu/research/biometrics/default.html

are composed of bodily readings that are always partial, fragmented and detached from the physical entireties to which they belong – and which they are increasingly taken to represent the individual in a universalistic sense of identity.

Fingerprinting is perhaps the most widely known, and likely the most extensively used, identification device. It is also one of the earliest technologies for identity recording and recognition; ever since its pioneering use in the American West of the late 19th century by Pinkerton's National Detective Agency, the technology has also been indelibly connected to criminal investigation in the popular imagination. Originally conducted only on a manual basis, contemporary fingerprinting procedures are today facilitated by the use of fingerprint scanner systems that are, in their turn, aided by computer processing programmes and linked to data archives. Fingerprint scanners read and automatically evaluate distinct characteristics such as the skin contours (ridges and valleys) of the human hand, and the scanned fingerprint image is then converted to mathematical vectors called minutiae. Certain sensor devices are capable of reading any finger on either hand, at varying positions and pressures. In this sense, the long history of fingerprinting as both technology and technique lends itself to a surety that other, sometimes more sophisticated, biometric technologies do not yet possess. In addition, fingerprinting remains comfortably familiar as a technology; it is also cost-effective and arguably the least intrusive method of bodily identification. "You are your fingerprint (U.are.U fingerprint scanner)," runs an advertisement for Digital Persona, a company which has specialised over the last 25 years in the production of biometric devices with a focus on fingerprint recognition. According to Favio Righi, owner of Digital Persona, "Objectively speaking, fingerprint patterns are as likely to be repeated as snowflakes" (Keener 2000).

Remote controlled and operated cameras, employed in central public spaces are the next most widely used of biometric devices. Municipal councils ranging from Cambridge, England to Johannesburg, South Africa have recently turned to the installation of city centre surveillance systems as a way of responding to public concerns regarding both personal and property crime. The argument generally given in favour of these surveillance systems is that not only that are they a cost-effective way of policing the inner city (day and night) by remote means, but they also increase police response times and provide a record of activity which may then be used as evidence in a court of law. Such reasoning has its obvious extensions on both technological and public policy grounds; the recent combination of the two has encouraged the idea of "preventive" surveillance. Such surveillance incorporates technologies that seek to anticipate criminal and/or anti-social activity by targeting

specific categories of socially suspect individual: lately, remote-controlled cameras have become available for installation with face recognition software attached to their visual processing systems. Clearly, the multiple linking of such visual and data systems is but a step away from more intensive networking scenarios that would extend the use of databases into every (literal) walk of life. 1984 has arrived late, but well equipped.

A more recent technology that focuses attention on the combination of human physiology with individual attributes of physiological activity is that of voice recognition. Currently, acoustic microphones with voice authentication software are more easily obtainable than ever before. An ever-increasing range of biometric devices can be used on Microsoft Windows and other commercially available software; since the summer of 2000, some manufacturers have been shipping their laptop computers to retailers – already equipped with biometric devices. Such devices exist to meet any degree of security and suspicion (such as computer passwording) but can also be utilised in a further range of applications when connected to employee, or even customer, surveillance systems. The current sophistication of voice recognition technology is such that, when coupled with quite basic recording programmes, it is now possible to monitor verbal communication on a virtually continuous basis (depending upon equipment sensitivity and/or device density proximate to the targeted subjects)– with the added dimension of selectivity. The latter dimension is incorporated by way of recording conversations that feature specific words and/or phrases as trigger points. In conjunction with voice recognition abilities, this technology can now pick out specific people as well as specific conversations, thereby reigning in the reach of surveillance possibilities to within economic limits of analysis.

Biometrics technologies have also been applied to a range of contexts where security concerns may dominate the built environment: military installations, sensitive documentation centres and government buildings, for example. Of more interest is, perhaps, their increasing application within the private sector, where commercial laboratories for proprietary products as well as high-level corporate offices are being fitted with security systems that incorporate biometrics technologies. On the one hand, such changes to the working architecture of the commercial environment speak of the extension of previously rarefied technologies into the public realm. On the other, they highlight the ways in which so much of the content of contemporary communication is becoming simultaneously privileged and guarded in the modern world of information as commodity.

When it comes to security concerns, three biometrics technologies have received particular attention lately: retinal scanning, iris scanning, and hand

geometry analysis. Retinal scan devices read the pattern of the blood vessels inside the eye; they are also now available to those individuals and institutions willing to pay top dollar for such sophisticated technology. Iris scanners read the unique pattern formed by tissues at the front of the eye. Because these patterns are far more differentiated than fingerprints, they are also more accurate in terms of recognition precision. Iris scanners are thereby tougher to defeat than their fingerprint counterparts and may yet supersede them as a form of common identity verification. Yet, while highly accurate, iris scanning can also be physically uncomfortable for the average person – who must get physically close to the scanner in order for a proper reading to be accomplished. In contrast, a less intrusive technology remains hand geometry, which measures the height of the fingers, the distance between the joints and the shape of the knuckles – but is considered somewhat less accurate than other approaches, and therefore less frequently employed.

Once a part of the paranoid fiction of Hollywood movies featuring one secretive government agency after another, each of these technologies is now an accepted part of many ultra-secure access facilities in the present day – a part of the ordinary working lives of thousands of scientists, civil servants and military personnel. This circumstance would have little bearing on its own, except that it is a reality which is but part of the widening presence of biometrics in all walks of life. Do we now await a further synthesis of biometrics technology with the human body? Are we ready for a postbiological body?

Biometric Extension of the Body

"A liar's blush may expose terrorists..." noted Roger Highfield in the *Irish Independent* of 7 January, 2002. His statement underlined the way in which high definition thermal imaging technologies (recently developed at the Mayo Clinic in Rochester, Michigan) might be applied to a variety of security contexts. Such application could soon mean that "... terrorists who attempt to conceal their real identity while trying to board a plane or enter a government building could be identified by the way they blush." While this scenario may exist as one of the most current examples of identification and encoding technologies leading to a concrete material result (i.e. apprehension and incarceration of a suspected criminal), the debate over bodily encoding and its eventual consequences is of far longer standing.

In the twentieth century, the efficiency considerations of machine/human combinations became popular in military circles when technological advances extended human capabilities on the battlefield and, in some cases,

even replaced them (as in the case of aerial reconnaissance drones, cruise missiles, etc.). Discussing the disguised uses of Cybernetics Theory as applied to virtual and artificial life for military applications, Katherine Hayles once noted:

"Here the idea of emergence is foremost – the thought that complex systems, when recursively restructured, can spontaneously evolve in directions their creators did not anticipate" (Hayles 2001, pp. 16-17).

In line with the above statement, she considers the aspiration to "conceptualize human being and human cognition in terms that allow to be articulated seamlessly with intelligent machines" (Hayles 2001, p. 18) as an important impulse of contemporary life. She further argues that various ideas – such as Hans Moravec's prediction of the impending downloading of human consciousness into a computer – contribute to the erosion of the significance of embodiment and its primacy of corporeality. This is a line of thinking that fundamentally engages Western culture's attitude towards how the body is simultaneously understood: both as subject and object. Not least, it is a notion critically encountered in the work of Maurice Merleau-Ponty (1962, 1968a, 1968b), who vehemently argued against unlimited abstraction by considering the ways in which the human body is both sentient and sensuous, a doubling that cannot be reduced to mechanistic representations of the self.

Nevertheless, the march of technological endeavour seems to remain uninterrupted: in August of 1998, Prof. Kevin Warick, made news by having himself injected with an encapsulated microchip. The capsule held an electromagnetic coil and a silicon chip, the implant allowing him to turn on lights and open doors that were linked to computers which could electronically sense his presence. Warick, Head of the Cybernetics Department at the University of Reading, was experimenting with the technical possibilities of communicating and interacting with computers. While he was prepared for the relatively innocuous physical changes as a result of the medical procedure, the mental affects – which he described as "feeling strange" – seemed to find him considerably less prepared on a psychological level. "I feel mentally different. When I am in the building I feel much more closely connected with the computer. I am not a separate thing. I am a scientist, so that is strange for me, but that's how I feel. It changed what I feel like mentally which I hadn't expected and which is very strange and a bit scary,"[5] is how he described his altered state.

Does Warick's experiment herald a new stage arrived in the man/machine interface, a postbiological body that crystallises cyborgean reality?

[5] http://abcnews.go.com/sections/world/DailyNews/cyborgman.html)

Postbiological Bodies and bioMEMs?

The post-biological condition of the human body has long been popularised in science fiction literature. Prominent descriptions in this genre range from the fully sentient cyborgs of Philip K. Dick's *Do Androids Dream of Electric Sheep* (1968) – later to be filmed by Ridley Scott as *Blade Runner* (1982) – to the "intelligent biochips" found in Greg Bear's *Blood Music* (1985) and a human consciousness transferred onto computer memory in William Gibson's more recent "The Winter Market" (1995). These creations may seem at first glance to be firmly embedded in the realm of literary creativity, but like many past such imaginings, are just as likely to be harbingers of the future in a Vernean vein.

In the second half of the last century, the general issue of blurred boundaries between man and machine received increasing interest from scholars and artists alike. In the new millennium, such interest has hardly abated – along with issues of changing identity that remain deeply embedded in the surrounding public discourse. One important commentator of late has been Eugene Thacker. While Thacker's academic background is in critical and literary theory, for several years now his interests have centred on the intersection of art and science, the latter with respect to biotechnologies, in particular. In an interview (on 30 March, 2001) with Josephine Bosma, Thacker revealed that texts investigating how the body is reconfigured by various technologies, such as the theories of George Bataille and science fiction writers like J. G. Ballard and Michael Blumlein, inspired his own art work and published texts. One of his recent art projects focusing on the Visible Human Project[6] by the National Library of Medicine directly refers to the notion of digital anatomy, and was exhibited at Ars Electronica in 1999. Thacker said that while looking at the Visible Human Project on the Internet, he was struck by the objectification and information transfer of this physically sliced and digitally encoded corpse, and drew inspiration from it for his piece on what he terms "databasing the body."[7]

In his lecture at the recent "Fashioning the Future" conference (Society for the Social Studies of Science, 1-4 November, 2001) held in Cambridge, Massachusetts, Eugene Thacker presented his views regarding "Wet Data: Biomedia & BioMEMS."[8] He noted that as far back as 1959, the Nobel Prize physicist Richard Feynman (while outlining his vision of future technologies) predicted the development of miniature devices with control abilities at mo-

[6] http://www.nlm.nih.gov/research/visible/visible_human.html

[7] http://www.nettime.org Lists-Archives/nettime-l-0103/msg00175.html

[8] http://www.nettime.org 07 Nov 2001

lecular and atomic levels. Feynman also pointed out that while the networked power of cellular structures has already been recognised by molecular biologists, the same phenomenon also provides an excellent model for use in information technologies.[9] In ensuing decades, his vision greatly influenced scholarly research spanning a wide range of bioscientific disciplines such as nanotechnology and molecular biotechnology. Today, bio-micro-electro-mechanical systems (bioMEMs) are widely used in specific areas of diagnostic medicine.

Between the 1960s and the turn of the century, the pragmatic results of Feynman's predictions become evident well beyond the field of biotechnology, both in communication and information research and development. Inevitably, this progress has also created new dichotomies: on the one hand, the rapid development of biotechnologies led to improved clinical diagnosis, simultaneously, the related technological advances foregrounded philosophical considerations regarding the relationship between the biological body and machine/technology, including the future use of micro devices. Yet whether the microchips are used for medical diagnostics or identification, the ethical questions of redefining the shifting man/machine paradigm have remained cogent due to a similar set of circumstances. Indeed, "Are bioMEMs simply tools, or are they in some way viable, living systems," as Thacker has questioned. We might add the question that in view of these developments, how do we define the boundaries between the source (biological body) and the encoded, in-organic data, especially as these technologies are capable of drawing together biological and non-biological materials in an often seamless flow, thereby creating a hybrid cybernetic system in the process?

Transcoding the Body

As Eugene Thacker has noted, certain tools "such as microarrays have as their main function the transmission of data types across media, and such devices act as a kind of fulcrum transmitting data from one platform to another."[10] The media theorist Lev Manovich (2000) has labelled the transmission of encapsulated information across hybrid media "transcoding." The process of transcoding, Manovich suggests, goes far beyond routine technical procedures, and involves the transference of concepts and categories of thought from one medium to another. Thus, the computer logic of bioMEMs

[9] see Feynman, Richard "There is plenty of room at the bottom" http://www.zyvex.com/nanotech/feynman.html

[10] http://www.nettime.org 07 Nov 2001

and/or identification data, stored and distributed has far reaching, transforming consequences influencing our cultural views and everyday life behaviours.

Perhaps the best known example of transcoding is, of course, genomic profiling, including the extensive data collection known as the Human Genome Project. International contributors to this initiative – as much as it has been publicised – have mapped and assembled structural human genetic information since 1990. The major goals of the project were to (1) identify all of the approximately 30,000 genes in human DNA, (2) determine the sequences of the 3 billion chemical base pairs that make up this DNA, (3) store this information in databases, (4) improve technological tools for data analysis, (5) transfer related technologies to the private sector, and (6) address the ethical, legal, and social issues (ELSI) that may arise from the project itself.[11] A working draft of the entire human genome sequence was announced in June 2000, with analyses published in February 2001. Notably, the announcement indicated that the mapping of the human genome had been completed ahead of the specified target dates with the assistance of interested corporations such as Celera and DoubleTwist.

While corporate involvement provided invaluable assistance to the Project, it goes without saying that this involvement was also aimed at the successful pharmaceutical development of genetic medicine and bioinformatics (the computerisation of biotechnology). Bioinformatics forms a bridge between the source (human body) and encoded inorganic information. The available computer resources of the sponsoring corporations contributed to a smooth informatics process of encoding and decoding. "So, what we are facing, philosophically, technically, and politically, with an event such as DoubleTwist's annotated genome, is not the incorporation of the body into technology, and it is not a process of disembodiment – despite the far-reaching tendency towards informatics. Instead, we are seeing steps in a long, complex process of the creation of the conditions for an informatics-based approach to the body, where data not only encodes the molecular body, but it also precedes and constitutes the body."[12] This process is, too often, an unreflective one (in so much as it is primarily profit-driven in the commercial context). While such reflection has surfaced in the media as a result of increasing public concerns regarding the exponential nature of technological advances, it is in the artistic community where one may often find unhindered commentary on issues related to biometrics, bioinformatics and other bodily technologies.

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[11] http://www.ornl.gov/hgmis/

[12] See Thacker's article The Post-Genomic Era Has Already Happened (Originally posted at The Thing Reviews http://bbs.thing.net

Body, Technology and Art

Cyborgean, posthuman, postbiological theories have been debated in a wide variety of often controversial publications such as those of Dana Haraway (1985) and N. Katherine Hayles (1999). In this respect, Eugene Thacker often refers to "wet data" and "moist technology," concepts that have been extensively explored and presented by Roy Ascott. "Between the dry world of virtuality and the wet world of biology lies a moist domain, a new interspace of potentiality and promise" writes Ascott (2000, p. 2) in an introductory essay entitled "Edge-Life: technoethic structures and moist media." He proposes that so-called "moist media," including atoms, neurons and genes, will be a significant, transformative agent in the art of this coming century. His prediction rests not on rash assumptions but on the recognition of an established trajectory of artistic endeavour over the last half decade.

Body centred art – especially expressed through early video works by Valie Export, Carolee Schneemann and Marina Abramović – became increasingly visible in the 1960s. Valie Export's innovative body performances in the late sixties involved the strapping of various visual devices to her body. Her *Touch Cinema* (1968) and *Action Pants: Genital Panic* (1969) performances were forerunners of future wearable, digital works such as those of Steve Mann.[13] Mann is the inventor of the "WearCam," a wearable computer with visual display capabilities. Although beginning as a simply recording device, later versions of this personal imaging system were incorporated into eyeglasses that inverted conventional surveillance situations, thereby giving Mann the ability to reverse the gaze of technology in a manner which highlighted the uncomfortable power of institutional forces in contemporary society (see Mann 1998). Not surprisingly, his (undetected) use of the Wearcam, which involved recording the surveillance devices and operators (i.e. in department stores) whose original role was encode his image into their surveillance system received quick attention in both the artistic and mainstream communities.

Building on the work of the 1960s pioneers, an escalating number of artists over the past decade have experimented with intimate investigations of their own bodies. These artistic (and often performance oriented) "experiments" have frequently included relatively radical surgical interventions and/or the bodily incorporation of robotic, prosthetic extensions. The works of Stelarc, Orlan and Mona Hatoum are among the best recognised in this arena of artistic enquiry. Stelarc's work is focused on the "obsolescence" of the body, and in his performances he has experimented with various robotic prosthe-

[13] http://wearcam.org/index.html

ses to "update" his biological body. Since 1990, Orlan has undergone a series of plastic surgical operations in order to transform herself into a new visage, a new being. In one of her best known works: *Corps étranger* (1994), Hatoum inserted a camera into her body cavities, thereby providing unusual, uncomfortable yet intimate interior body-views for her audiences.

Seiko Mikami uses less provocative, but equally intriguing means to present interactive installations such as *Molecular Informatics – morphogenic substance via eye tracking*, which incorporates "eye tracking input" technology. Structures of molecules are generated in real-time according to the movements of the viewer's eyes during their "interaction" with the installation technology. The viewer wears a pair of virtual reality (VR) glasses equipped with an eye-tracking sensor and observes – and creates – the VR space. The physical movements of the viewer is transcoded into data recording the individual's location within the 3-Dimensional space and, as a result, the viewer find him/herself in a world of molecules and molecular formations. Over the years, Mikami has built several versions of this project, the latest (Version 4) of which includes a sound recognition program in order to add an acoustic dimension to the performance of interaction. In his own words: "You can hear another person's eye movements in space via sound."[14]

In another installation project titled "World Membrane and the Dismembered Body," Mikami changes physiological tack and utilises the audience's heart and lung sounds in order to generate the substance of interaction. The participating viewer's internal body sounds are amplified and digitised by a computer. The digital signals then act as mathematical parameters to form what he calls "a continuously transforming 3-D polygon mesh expressing sounds and images in the room." These sounds and images are then complicated and enhanced as the exhibition visitor's ear – serving as a continuing interface to the audible noises that his/her own body emits – creates feedback for the system. Such feedback not only emphasises the technological circuit embedded in the performative installation, it also highlights the ways in which the use of various technologies is already an integral part of our daily lives in an unobtrusive, but influential manner.

The Art of Biometric Intrusion

"More than anticipate profound changes in perception, in our conception of the world, and in the reorganization of our socio-political systems,

[14] http://bionet_org.tripod.com/eye3.html

these pioneers foresee fundamental transformations in our species," noted Arlindo Machado[15] in his analysis of Eduardo Kac's *Time Capsule* (1997) project, the very project which best illustrates the general theme of this discussion.

Time Capsule is part performance, part lived reality; it represents a willing cyborg connection within the body of the artist, one that speaks of genealogical (and thus human) time as much as its technological products. The project, which focused on the implantation of an identification microchip into the ankle of Kac, took place at the Sao Paulo cultural centre Casa das Rosas on the 17th of November, 1997. The nine-digit microchip was registered via Internet with a database in the United States. Beyond the surgical procedure (carried out under sterile conditions with clinical assistance), the audience also witnessed several sepia photographs lining the walls of the centre. Symbolically linking memory and identity, and emphasising both the temporal and ephemeral features of this artwork, these photographs were family portraits of the artist's family members in Poland who had been exterminated during the Second World War. Nearly immediately following the surgical intervention, scanned images of the artist's body, including a x-ray showing the microchip insertion procedure became publicly observable on the Internet. The event was extremely well publicised on national television and in the printed press, thereby reaching both a general public in Brazil and a global audience via the Internet. Kac would later comment on the project by noting:

"The emergence of biometrics, with its conversion of irrepeatable personal traits – such as iris patterns and fingerprint contours – into digital data, is a clear sign that the closer technology gets to the body the more it tends to permeate it. Experimental medical research towards the creation of artificial retinas using microchips imbedded in the eye in order to enable the blind to see, for example, forces us to accept the liberating effects of intrabody microchips. At the same time, the legal seizing and patenting of DNA samples from indigenous cultures by biotech companies, and their subsequent sale through the Internet, shows that not even the most personal of all biological traits is immune to greed and to technology's omnipresence."[16]

Kac's commentary foregrounds the difficult and uneasy, socio-political and ethical issues that are present with the commercial availability of biometric devices. His *Time Capsule* is shown to act as not only a personal initiative of artistic creativity but also a direct challenge to the socially constructed nature of ideas of bodily intrusion. In this general regard, Machado has observed that:

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[15] Machado, Arlindo 1998 "A microchip inside the body" nettime 22 February

[16] http:www.ekac.org/timec.html

"As the placement of a foreign body (Duchamp's urinal) in the sacred space of the museum had unpredictable consequences for subsequent art, the implantation of a microchip inside the body of an artist will intensify the debate on the paths that both art and the human species will travel in the next millennium" (Machado 1998).

Disappearance and Dispossession

According to Machado, one can easily interpret Kac's bodily intervention as a warning signal of the impending use of technologies in a surveillance society of the foreseeable future. A microchip, such as the one now implanted in Kac, could be similarly implanted in anyone at birth, and then used as a significant tool for the purposes of lifelong identification and monitoring. Yet another interpretation suggested by Machado identifies a possible biological mutation utilising implanted digital memories in order to supplement or replace one's own memories. This eventuality might have easily been the artist's intention all along; by displaying the photographs of deceased family members along with the numerically encoded data of his own body, *Time Capsule* presents us with a series of personal, social and technological juxtapositions. These juxtapositions may be taken to act as a reminder of the scope of historical changes pertaining to wider power relations within society – and distinct views on the place of the individual as body (and body as legitimate individual) vis-à-vis the state. The main question here is obviously one of control, a control that surfaces, and resurfaces, each time the individual must confront the sort of institutional forces that create, control, or seek to control, both the technologies we see, and those we too frequently overlook.

Lately, the identity theft of biometric data has become a serious concern for those individuals (as well as institutions) that are aware of the intrinsic fragility of electronic information. Large databases of information are always liable to a variety of both cataloguing and processing errors. These errors may be minor at times, but their impacts in an increasingly networked world may have very real (that is, drastic) consequences for an individual – all individuals – who by bureaucratic necessity exist as a series of legal, commercial, and social categories in one and many files. This circumstance is but a relatively benign predicament, however, for in addition, there is the very real risk that the information in a given database may be used for unanticipated, unintended, and possibly illegal, purposes. Such misuse immediately brings to mind the possibilities of electronic terrorism side by side with the violent versions with which we began our discussion. After all, just as the production of

encoded information becomes readily available through biometric technologies, so too do the opportunities for the counterfeiting of biometric information, whether it is in terms of pictures, fingerprints or retinal scans. As David Lyon has noted recently: "The rise of surveillance societies has everything to do with disappearing bodies" (2001, p.15).

This sense of disappearance lies at the very heart of biometric technologies in as much as they not only enhance institutional controls on the body in ways which Foucault (1977) never anticipated, but in how they contribute to what may be understood as a *dispossession* of the body. Such dispossession is achieved by virtue of the body's transformation into something neither fully corporeal nor completely mechanical. This dispossession of the body is conducted through the capture of the body's image, in the first instance. Retinal scanning, iris scanning, hand geometry analysis and their sister technologies do not merely represent the body; in the sense of their fundamental malleability as encoded information they transform its very physical veracity. In the second instance, dispossession is achieved by way of a heuristic slight-of-hand wherein the primacy of technological means overshadows any other forms of knowledge regarding our bodies, regarding us. Where once our identity was our bodies, it can now take the form of a computer file. Will the resultant dispossession leave us with an imagined authenticity far removed from the corporeal nature of our birth? Will this be by choice?

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