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New Instruments of Surveillance and Social Control: Wireless Technologies which Target the Neuronal Functioning of the Brain

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Increasingly there are indications that the uses of wireless technologies have been developed to target an individual's biological body, with specific focus upon the neuronal functioning of the brain. In this paper I examine how some of these uses have had detrimental effects, and what this implies for both present and upcoming developments for particular wireless/sensor technologies. I consider whether this is not shifting dangerously towards a psycho–civilised society, where greater emphasis is placed upon social control and pre–emptive strategies.

Introduction

The rate of technological innovation in some fields is developing exponentially with new advances in wireless sensor networks, ubiquitous and pervasive computing, motes, nodes, grids, and media platforms. Information flows are increasing not only in their quantity and density, but also in their immersive quality. The historical developments of information communication systems can be said to have traced a similar path to how nation states have organised their global power base and dominance. First, power over the land and dominance in waging war on one's neighbours through ground battle, the domesticated horse and the infantry soldier. Second, domination of the seas and the strongest Navy gave advantage to sea–faring Empires, such as Portugal, Spain, and Britain. The end of naval dominance then gave rise to the advent of the railroad and the dynamic change in transport technology, both in routes and in speed. The transcontinental scope of the railroads finally gave out to air power, winning the World Wars through dominance in the skies. And now, finally, the 'final frontier' is space, for 'the vast potential resource base of outer space is presumably so enormous, effectively inexhaustible, that any state that can control it will ultimately dominate the earth' [1].

Likewise, modern communication technologies have moved from the land (the telegraph); to the sea (wireless radio; radar); back to land (cables; fibre optics); and to the intermediate land/air stage (masts/antenna); to the outer frontier of space (satellites); and finally now even beyond these frontiers towards a solar system Internet (Turner, 2007). Whoever controls these channels for communication can, in some degree, to be said to 'dominate the earth'. And the possible uses of wireless communications for the dissemination, targeting, and receiving of clandestine 'communications' is an active industry.

The aim of this paper is to examine some of the examples and instances where the use of wireless technologies have been developed to target an individual's biological body, with specific focus upon the neuronal functioning of the brain. I also show how some of these

uses have had detrimental effects, and what this implies for both present and upcoming developments in particular wireless/sensor technologies. This paper shows that an upcoming area of importance is neurotechnology, a discipline that places brain functioning and knowledge of the human brain as primary. Technologies are now being researched and trialled that seek to penetrate and, to a degree, intervene in neural functioning. Whilst some have termed this positively as a coming 'neural society' (Lynch, 2004), I consider whether this is not shifting dangerously towards a psycho–civilised society, where greater emphasis is placed upon social control and pre–emptive strategies. I trace a timeline that follows developments from a historical context to the present; and finally to future scenarios and implications. It may be that the social pursuit of increasingly connective and immersive technologies has the potential to open up a Pandora's box of problematics.

Opening Pandora's box

The background to this narrative begins with the story of a true Pandora's box — a U.S. project titled Project Pandora that was organized and administered by the psychology division of the psychiatry research section of Walter Reed Army Institute of Research (WRAIR). This project was set–up to specifically research programs on the health effects of microwave exposure following the 'Moscow Embassy' incident. From 1953 to 1976, the Soviets directed microwave radiation at the U.S. embassy in Moscow from the roof of an adjacent building. Whilst this clandestine microwave targeting was allegedly known for some time by U.S. officials, the event was not made public until 1976 when the U.S. State Department finally accused the Soviet Union of bombarding the U.S. embassy in Moscow with microwave radiation for illicit purposes. It was initially reported as a harmless procedure for charging Soviet spy–bugs: 'Soviet antennas, which are beaming the waves in both to charge up the batteries of their listening devices and to jam embassy–based U.S. electronic monitoring of Russian communications' (*Time*, 1976a; 1976b). However, the State Department soon indicated that, in addition to interference mechanisms, the microwave radiation could have serious adverse effects on the health of the occupants of the embassy (O'Connor, 1993). This was supported by Soviet data in which Soviet non–ionising electromagnetic energy (NIEM) 'research literature reported adverse health effects in laboratory animals and in Soviet radar workers at levels well below the 10 mW/cm2 U.S. ANSI safety recommendations' [2]. Despite this being below the U.S. recommended levels the Soviet standards excluded military personnel whilst the U.S. did not, according to the National Council on Radiation Protection and Measurements (NCRP), 1986 (O'Connor, 1993).

Soviet studies in the area of electromagnetic microwave radiation reported psychological symptoms in human subjects that included lethargy, lack of concentration, headaches, depression, and impotence [3]. O'Connor notes how the Soviet medical journals termed these collective symptoms microwave sickness whilst the U.S. literature referred to the symptoms as neurasthenia (1993). *Time* magazine reported in March 1976 that the State Department launched:

> a medical investigation of the thousands of U.S. diplomats and their families who served in Moscow since the early 1960s. In the wake of the microwave disclosures, former embassy employees and their families have recalled suffering strange ailments during their tenure in Moscow, ranging from eye tics and headaches to heavy menstrual flows. Some point out that former Ambassadors to Moscow Charles Bohlen and Llewellyn Thompson both died of cancer, within the last two years one other Moscow diplomat died of cancer, and five women who lived there have undergone cancer–related mastectomies

> — although no medical authorities attribute these deaths and illnesses to radiation. (Time, 1976b)

U.S. officials and military, long before the public exposure, were aware and concerned about the consequences of microwave bombardment of civilian and military targets. In 1972 the U.S. Defense Intelligence Agency (DIA) released an internal report (later declassified through the Freedom Of Information Act [FOIA] Program [4]) that had been previously prepared by the U.S. Army Office of the Surgeon General Medical Intelligence Office titled 'Controlled Offensive Behaviour — USSR' (initially released in July 1972). The report states that

> This report summarizes the information available on Soviet research on human vulnerability as it relates to incapacitating individuals or small groups. The information contained in this study is a review and evaluation of Soviet research in this field of revolutionary methods of influencing human behavior and is intended as an aid in the development of countermeasures for the protection of U.S. or allied personnel. Due to the nature of the Soviet research in the area of reorientation or incapacitation of human behavior, this report emphasises the individual as opposed to groups. (LaMothe, 1972)

It is interesting to note that the Report authors believed the Soviet research to be in the area of 'reorientation'; suggesting that the U.S. were worried over concerns that the Soviets may be planning a mass zapping of U.S. citizens with the hope of 'brainwashing' them into a newly orientated ideological outlook. The 174–page Report is extensive, with much material extended upon various forms of beamed energies and wireless strategies. On the opening section on Electromagnetic Energy the report concludes that

> Super–high frequency electromagnetic oscillations (SHF) may have potential use as a technique for altering human behavior. Soviet Union and other foreign literature sources contain over 500 studies devoted to the biological effect of SHF. Lethal and non–lethal aspects have been shown to exist. In certain non–lethal exposures, definite behavioural changes have occurred. [5]

During this time the U.S. establishment was not naïve to the potential of conducting neurological *at–a–distance* effects upon human behaviour.

In the 1970s José Manuel Rodríguez Delgado was a controversial figure in neuroscience; a professor of physiology at Yale University, he was an acclaimed neuroscientist. In 1970 "the *New York Times Magazine* hailed him in a cover story as the impassioned prophet of a new 'psychocivilized society' whose members would influence and alter their own mental functions" [6]. Yet two decades earlier, in 1952, Delgado co–authored the first peer–reviewed paper describing long–term implantation of electrodes in humans (Horgan, 2005). As an example of the achievement into wireless–neurological devices Delgado's most famous experiment took place in 1963 at a bull–breeding ranch in Cordoba, Spain. Delgado implanted radio equipped electrodes, which he termed 'stimoceivers', into the brains of several 'fighting' bulls and stood in a bullring with one bull at a time and attempted to control the actions of the bull by pressing buttons on a handheld transmitter. In one instance Delgado was able to stop a charging bull in its tracks only a few feet away from him by the press of a button. The *New York Times* published a front page story on the event,

"calling it 'the most spectacular demonstration ever performed of the deliberate modification of animal behavior through external control of the brain'" [7]. In 1969 Delgado described wireless brain–behaviour modification and its implications in his book *Physical Control of the Mind: Toward a Psychocivilized Society* (1969). Delgado's research during this time was supported not only by academic grants but also by the U.S. Office of Naval Research. This research is now over forty years old, and much has happened in the intervening four decades.

> Technologies that can wirelessly transmit information from and to the body is an area of research that has attracted various interested parties post–World War II. Such energy–information distribution and targeting within the electromagnetic spectrum can variously be used for medical, industrial, military, and telecommunications purposes. I now turn to examine some of the military–industrial research and uses of wireless technologies.

Beams, firewalls and brain scanning: Inside the military–industrial complex

Researcher Igor Smirnov of the Russian Academy of Sciences is by all accounts an odd person, referred to by a *Newsweek* article as 'A Subliminal Dr. Strangelove' (Elliott and Barry, 1994). Smirnov was apparently contacted by the FBI during the Davidian sect siege in Waco, Texas in 1993. Experts from the FBI Counter–Terrorism Center met with Smirnov in Arlington, Virginia to discuss ways of affecting the behaviour of Davidian sect leader David Koresh. Smirnov's plan was to send subliminal messages through the phone lines during negotiations; and for targeting David Koresh the plan was to use the voice of Charlton Heston to subliminally play God (Elliott and Barry, 1994). Smirnov's strategies, whilst sounding eccentric, are closely tied with military research into behaviour modification via wireless transmissions. Smirnov's laboratory in Moscow is named the Institute of Psycho–Correction and using electroencephalograph scanning (EEG) he measures brain waves which he then computes to create a map of various human impulses–brain waves correlation. This data can then be used for experimenting upon affecting brain–body modification at–a–distance. Asked in a 2004 interview whether it was possible to defeat terrorism Smirnov replied that

> Only informational war is capable of defeating terrorism completely. And we possess this weapon. Peoples' actions can in fact be controlled by unnoticed acoustic influence. Look — it's easy. All I have to do is record my voice, apply special coding, which converts my voice to mere noise and afterwards, all we have to do is record some music on top of that. The words are indistinguishable to your conscious; however, your unconscious can hear them clearly. If we were to play this music over and over again on the radio for instance, people will soon start developing paranoia. This is the simplest weapon. (Pravda, 2004)
>
> Smirnov's capabilities were demonstrated to U.S. observers as far back as 1991 when infra–sound — a very low frequency transmission — was shown to be able to transmit acoustic messages via bone conduction [8].

Military strategist Timothy Thomas examined these implications in his paper 'The Mind Has No Firewall' in which he states that 'We are on the threshold of an era in which these data processors of the human body may be manipulated or debilitated. Examples of unplanned attacks on the body's data–processing capability are well–documented' [9]. He references a

Russian military article on the same subject which declared that "'humanity stands on the brink of a psychotronic war' with the mind and body as the focus" [10]. The context here is that the human body is a complex communication system that is constantly receiving signal inputs, both external and internal. Thus,

> The "data" the body receives from external sources — such as electromagnetic, vortex, or acoustic energy waves — or creates through its own electrical or chemical stimuli can be manipulated or changed just as the data (information) in any hardware system can be altered. [11]

Military thinking in this area is beginning to shift towards a systemic viewpoint which considers the human as an open system rather than as a closed, bounded system.

In this new systemic approach the human communicates with, and can be communicated by, the environment through information flows and communications media. By this understanding military thinking has begun to openly declare that 'one's physical environment, whether through electromagnetic, gravitational, acoustic, or other effects, can cause a change in the psycho–physiological condition of an organism' [12]. Simpson's investigations into the sociological discipline of communication research, which crystallised in the U.S. in the early 1950s, shows that it was financed and mentored by governmental psychological warfare programs:

> Government psychological warfare programs helped shape mass communication research into a distinct scholarly field, strongly influencing the choice of leaders and determining which of the competing scientific paradigms of communication would be funded, elaborated, and encouraged to prosper. [13]

Dominance over the airwaves, and the capability to exert coercive control over information communications is a vital area in military planning. Documented and declassified evidence shows that what may have begun as a program in standardized propaganda and psychological warfare has now developed into research on wireless information targeting and 'psychocivilized' control practices. To this effect the term 'psycho–terrorism' was coined by Anisimov of the Moscow Anti–Psychotronic Center and Anisimov admits to testing such devices as are said to 'take away a part of the information which is stored in a man's brain. It is sent to a computer, which reworks it to the level needed for those who need to control the man, and the modified information is then reinserted into the brain' [14]. In such cases there is concern that the 'mind has no firewall' and may be vulnerable to accidental, unwanted and/or rogue interventions. Thomas's paper concludes by stating that 'In reality, the game is about protecting or affecting signals, waves, and impulses that can influence the data–processing elements of systems, computers, or people. We are potentially the biggest victims of information warfare, because we have neglected to protect ourselves' [15].

The Air Force Research Laboratory (AFRL) brief on this subject titled 'Controlled Effects' also noted the power to use the electromagnetic spectrum for wirelessly interfering into human subjects' thinking and behaviour. By this stage the strategy had been dubbed 'non–lethal weapons', as explored more fully in the work of non–lethal defence at Los Alamos by retired Army Colonel John B. Alexander (Alexander, 1999). The AFRL report states that

> the panel investigated the potential for using electromagnetic and other nonconventional force capabilities to achieve strategic, tactical, lethal, and nonlethal force projection … . For the Controlled Personnel Effects capability, the S&T panel explored the potential for targeting individuals with nonlethal force, from a militarily useful range, to make selected adversaries think or act according to our needs. (AFRL, 2004)

These theories and concerns to affect command and control at–a–distance were echoing the conclusions from a much larger and significant military report that was published and made available in 1996 titled 'New World Vistas'. 'New World Vistas' was a major undertaking by the U.S. Air Force Scientific Advisory Board to examine future developments in weapons, and totalled 14 volumes of studies. The fifteenth 'ancillary' volume concluded by putting forth some potential developments for a possible future man–machine integration. In a section dealing with 'Biological Process Control' the Report states that

> One can envision the development of electromagnetic energy sources, the output of which can be pulsed, shaped, and focused, that can couple with the human body in a fashion that will allow one to prevent voluntary muscular movements, control emotions (and thus actions), produce sleep, transmit suggestions, interfere with both short–term and long–term memory, produce an experience set, and delete an experience set. (USAF Scientific Advisory Board, 1995)

In military–speak the term 'experience set' implies a person's stored memories and life experiences; thus suggesting that such a technology could delete and then replace a person's memories, or 'experience set'. Research and development along these lines have so far materialised a technology dubbed by the military as *active denial system* (ADS).

The Active Denial System is a non–lethal, directed–energy weapon system recently unveiled by the U.S. military and which directs, or pulses, electromagnetic radiation at a frequency of 95 Gigahertz (GHz) towards the target subjects. The radiated beam of millimetre–wave energy can travel over a range of 500m and heats the water molecules in the epidermis skin up to 54C (130F) (BBC, 2007). The result can be an intensely painful burning sensation. Such a system was designed for such uses as crowd control. A fully operational and mounted system was demonstrated to journalists by U.S. military personnel at Moody Air Force Base, Georgia, on 24 January 2007. A Reuters correspondent who volunteered to be shot with the beam during the demonstration described it as 'similar to a blast from a very hot oven — too painful to bear without diving for cover' (BBC, 2007). The diagram below illustrates the *active denial system* (ADS).

Figure 1: The active denial system (ADS).
Source: http://www.specialsol.com/electr5.gif.

These technologies show uses of wireless–to–body communication and directed energy weapons for possible military attack or defence purposes. Another area for research and development is in both military and industrial uses for operator enhancement.

Real–time brain scanning of pilots and similar operators under stress is an increasingly active area for research involving military and industrial partnerships. Since the early 1990s

research has been made into detecting and interpreting brain and body signals, especially brainwaves, for computerized monitoring of pilots. This information can be used to measure pilot fatigue and to compensate for this with increased automation of the airplane in order to avoid pilot error. Initially this was conducted by measuring the pilot's brain waves through unobtrusive sponge sensors in the flight helmet:

> By measuring the amplitude of the brain waves generated, fatigue of the pilot can be recognized. By increasing the brightness of the instrumental panel lights, the amplitude of the brain waves can be returned to their normal height, thus compensating for fatigue. To get the "evoked response" from the pilot's brain, the instrument panel lights could be made to flash so fast that the pilot would not be aware of the flashes. [16]

Researchers have said that the brain can 'register' up to 145 flickers per second, which can then be followed up by beaming a near infrared light into the subject's eye, causing a spot of light to be reflected off the cornea in order to track eye movement and measure the degree of pilot concentration. This type of research, which is still ongoing, has been referred to by at least one current R&D laboratory as 'Real–Time EEG for Operator State' [17]. Brain monitoring of people in situations where fatigue could be fatal now involves real–time analysis and observation of motorists. A technology now being considered is one called 'Sensation'.

> This technology is non–intrusive and includes a small camera that monitors a driver's eye movements, looking out for repeated blinking, which can be evidence of tiredness. To compliment this the driver's seat is also lined with a material which monitors changes in body temperature. The steering wheel too checks for handling pressure. Finally, other sensors, if needed, can be fitted to the finger and ear to send out measurements of pressure to indicate fatigue and levels of concentration. The driver is now wirelessly monitored, both by camera and wireless sensors, to create a more extensive immersive driving experience (Millward, 2006).

This research and these innovations indicate that a shift is occurring in how the human is enmeshed into an increasingly information saturated environment. These developments recognise that the human body is itself becoming the most capable data–processing subject. The rest of this paper explores how these trends to envelop the body–brain into an environment of information flows are being developed into social and commercial applications.

Emotional gaming and dangerous intentions: Inside the social–civil sphere

The use of EEG brain scanning has now moved into the gaming industry with up–to–date developments in sensory gaming. Recently Emotiv publicly released information on their upcoming 'Project Epoc', a developmental technology that interprets electrical signals emitted by the brain and converts them into actions on a computer. In this way the user/gamer is able to direct actions via their thoughts in the online environment. Below are pictures of two prototypes which the company expects to market some time in 2008 [18].

The company Web site claims that they provide the ultimate human–computer interface and that they are pioneers in brain computer interface technology. In their press release of 7 March 2007 they state that

> Emotiv has created the first brain computer interface technology that can detect and process both human conscious thoughts and non–conscious emotions. The technology, which comprises a headset and a suite of applications, allows computers to differentiate between particular thoughts such as lifting an object or rotating it; detect and mimic a user's expressions, such as a smile or wink; and respond to emotions such as excitement or calmness. [19]

In the same press release the company foresees in the future that 'Emotiv's technology has the potential to be applied to numerous industries, including interactive television, accessibility design, market research, medicine, and security' [20]. A similar corporate gaming company, NeuroSky, claims to have gone even further than Emotiv and reduced 'the brainwave pickup to the minimum specification imaginable — a single electrode. Existing versions of this electrode are small enough to fit into a mobile phone and ... they will soon be shrunk to the size of a thumbnail, enabling people to wear them without noticing' (*Economist*, 2007). The company Web site claims its 'bio sensor and signal processing system for the consumer market' will unlock 'worlds of new applications such as consumer electronics, health, wellness, education and training' [21].

Clearly there is a potential commercial market envisioned here for wireless–brain technology that goes beyond the sphere of gaming. Somewhat on the extreme to this, wireless acoustic transmissions have now been developed to 'stop' people from over–gaming; in other words, as a treatment for gaming addiction. In highly technologised Asian countries such as South Korea teenagers are spending an unhealthy amount of time at their computers in gaming environments. There have even been instances where gamers have died after extensively long sessions in front of a computer without a break, such as in MMORPGs (Massive Multiplayer Online Role–Playing Game). South Korean company Xtive, established in 2005, spent a year of research to develop a system of acoustic sound waves that act as subliminal transmissions during the gaming experience:

> We incorporated messages into an acoustic sound wave telling gamers to stop playing. The messages are told 10,000 to 20,000 times per second ... . Game users can't recognize the sounds. But their subconscious is aware of them and the chances are high they will quit playing ... . Game companies can install a system, which delivers the inaudible sounds after it recognizes a young user has kept playing after a preset period of time. (Tae–gyu, 2007)

This emphasises that research into techno–information flows are increasingly being developed that wirelessly interact with a person as a biological construct, utilising the already present bio–neural functioning. And this is a trend that is attracting more corporate players wishing to enter the field.

Gaming giant Sony Corporation has submitted and been granted a patent on a device for transmitting sensory data directly into the human brain. Sony's patent describes the device

as firing “pulses of ultrasound at the head to modify firing patterns in targeted parts of the brain, creating ‘sensory experiences’ ranging from moving images to tastes and sounds” (Hogan and Fox, 2005). This is based upon a technique known as transcranial magnetic stimulation that activates the nerves by using rapidly changing magnetic fields to induce currents in brain tissue. The patent also claims that this technology could give blind or deaf people the chance to see or hear. Niels Birbaumer, a neuroscientist at the University of Tübingen in Germany who has himself developed similar devices, examined the Sony patent and commented that ‘I looked at it and found it plausible’ (Hogan and Fox, 2005). Since Sony’s initial patent application in 2000 (granted in March 2003), a series of further patents have been applied for. However, this line of research is not totally new.

For several years there has been research conducted into decoding thoughts from the brain for sending signals to an external device such as manipulating cursors on a screen, which has been developed for disabled people, as in the case of Matthew Nagle (Pollack, 2006). In recent years several other companies have emerged claiming to offer brain–computer wireless interaction for either gaming purposes or for various health impairment benefits. One example is S.M.A.R.T. BrainGames, a company based in California that offers EEG caps designed to treat people with attention deficit and hyperactivity disorder. The company claims to offer superior neurofeedback technology at what it calls ‘affordable prices’ [22]. The body–brain is increasingly shifting towards becoming a biologically–enhanced data processor for wireless reception and transmission. Computer software giant Microsoft is aware of this and already ahead of the game.

In 2004 Microsoft was awarded U.S. Patent 6,754,472, titled ‘Method and apparatus for transmitting power and data using the human body’ [23]. In this patent Microsoft is granted exclusive rights to a technology that uses the electrical capacity of the human body to act as a computer network (Adam, 2004). Microsoft envisages ‘using the human skin’s conductive properties to link a host of electronic devices around the body, from pagers and personal data assistants (PDA) to mobile phones and microphones, although the company is uncharacteristically coy about exactly what it may have in mind’ (Adam, 2004). This supports what Bill Gates himself has said about the computer finally disappearing into the environment and the world around us (Gibson, 2005). This may be the ultimate wireless network, using the complete skin of the body, from fingers to toes, receiving and transmitting flows of information. The patent also proposes that an area of skin could even act as a keypad making a person capable of typing by tapping on their arm (Adam, 2004).

This is a powerful example of how technologies and technological thinking is shifting away from external hardware devices towards using the natural bio-properties of the human body for integration into a global informational environment. As way of some examples, here are just two from many of the patents filed that claim to develop wireless transmission technologies: patents 4,395,600 and 5,507,291. Patent No. 4,395,600 is titled ‘Auditory subliminal message system and method’ and is geared towards subliminal messaging to influence consumer shoppers:

> Ambient audio signals from the customer shopping area within a store are sensed and fed to a signal processing circuit that produces a control signal which varies with variations in the amplitude of the sensed audio signals. A control circuit adjusts the amplitude of an auditory subliminal anti–shoplifting message to increase with increasing amplitudes of sensed audio signals and decrease with decreasing amplitudes of sensed audio signals. This amplitude controlled subliminal message may be mixed with background music and

> transmitted to the shopping area. [24]

In a similar manner for affecting an individual's mental state is patent no. 5,507,291 — 'Method and an associated apparatus for remotely determining information as to person's emotional state' — which comes very close to what has been discussed on military uses of information warfare:

> In a method for remotely determining information relating to a person's emotional state, a waveform energy having a predetermined frequency and a predetermined intensity is generated and wirelessly transmitted towards a remotely located subject. Waveform energy emitted from the subject is detected and automatically analyzed to derive information relating to the individual's emotional state. [25]

In this scenario information flows are two-way with the body-brain emitting as well as receiving. Yet with the human body–brain becoming a site for data transfer and reception, there are concerns that it is increasingly becoming a target for various corporate interests. And not only corporate interests are involved in these developments, however, for there are also recent innovative technologies in this area that offer serious implications for social privacy and liberty at a state level.

At first the idea sounds like nothing more than science fiction. Indeed, it even appeared as a central feature in the film 'Minority Report'. This is the notion of pre–cognition: to be able to know a person's actions before those actions are committed. Yet now a team of neuroscientists have developed a technique that can scan a brain and learn from the patterns of neuronal activity what a person is thinking or intending to do. This research is the culmination of recent studies where brain imaging has been used to identify particular brain patterns pertaining to such behaviour as violence, lying, and racial prejudice (Sample, 2007). To achieve this the team 'used high–resolution brain scans to identify patterns of activity before translating them into meaningful thoughts, revealing what a person planned to do in the near future' (Sample, 2007). This is the first acknowledged instance of having the technical capacity to judge whether people have the *intention* to commit a criminal act regardless of actual hard physical evidence of the crime. According to Prof Haynes: 'We see the danger that this might become compulsory one day, but we have to be aware that if we prohibit it, we are also denying people who aren't going to commit any crime the possibility of proving their innocence' (Sample, 2007). Since this technology is so new there are no current ethical or moral debates on this issue and the implications for its civil use are worrying. If developed these 'techniques may eventually have wide–ranging implications for everything from criminal interrogations to airline security checks. And that alarms some ethicists who fear the technology could one day be abused by authorities, marketers or employers' (Cheng, 2007).

A hypothetical situation in the future might place these scanning devices within regular x–ray scanning machines at airports. On passing through to the passenger lounge all travellers will be scanned not only for potentially dangerous physical objects but also for *dangerous intentions*. Yet who has not had a 'dangerous intention'? Or rather, to quote a more familiar phrase: 'He who is without sin among you, let him be the first to throw a stone' [26]. In this manner all travellers will have to safeguard their thoughts at all times; who is to know whether such scanning devices are embedded into the walls of the airport lounge and corridors? Or in the toilets; on board the airplane? This uncertain and somewhat

dystopian scenario is one that could shift technologised states into psycho–civilised societies where thoughts and intentions become part of terrorist discourse. This could be seen as an extreme case of convergence between the social compromises required to facilitate efficient physical–digital infrastructures and the need for securitised mobilities (Wood and Graham, 2006). It also resembles the extremity of constructing an all–inclusive technological web of complex information flows that bypasses traditional forms of interface.

This sees a shift away from earlier prototypes of the hardware–heavy cyborg, such as the early 'wearcam' work of Steve Mann [27], towards people actively engaging with their informational environments both in terms of security and surveillance. In some ways these developments have contributed to a rise in acts of self–surveillance, or *sousveillance*.

(In)Securities, self–sensoring and sousveillance: Inside the social panopticon

Fears over security and safety have reached new levels in the opening decade of the twenty–first century. It is, in all respects, a post–millennium state of insecurity. The older and more familiar paradigms of warfare and security were based upon binaries (*e.g.*, Democracy vs. Communism; friend vs. foe). To some degree this binary distinction is still maintained and played out in media and cultural discourse as Freedom vs. Anti–Freedom, or West vs. Islam. Yet upon deeper scrutiny this manifests as an asymmetrical arrangement: order/authority vs. guerrilla non–compliance. A terror suspect can therefore no longer be easily identified as 'the enemy' which requires that all civilians be categorised in a state of 'potential terrorist'. This is especially so since the notion of 'home–grown terrorist' is playing out the role of insurgency and resistance from within. This subtle shift in categorisation has seen a parallel move in the increase of the militarization of the civil sphere. By this I argue that civil space is increasingly becoming a 'censor/sensored zone' where security issues — surveillance, tracking, identification — are played out.

This zone, which mobile bodies pass through and negotiate, is characterised by a pervasive field of information, code, and signifiers that increasingly constructs the 'social'. Such a coded environment has the potential to be extremely intrusive and goes beyond the normal ken of so–called civil liberties. Under the sway of a post September 11 scenario and amid an orchestrated 'war on terror' many of these intrusive technologies are in rapid development, so much so that the U.K. Government's Information Commissioner himself states that we live in a surveillance society (Information Commissioner, 2006) [28]. These systems of tracking and tracing surveillance involve step changes that are taking place gradually in many industrialised societies, especially in the U.S. and the U.K. [29].

Developments in sensor technologies and ubiquitous computing often focus on the interfaces between person and environment such that interconnectivity is likely to become more pervasive, intrusive, and 'everywhere'. In a seminal essay from 1996 computer engineers Mark Weiser and John Seely Brown coined the term 'ubiquitous computing' and envisioned the 'social impact of imbedded computers may be analogous to … electricity, which surges invisibly through the walls of every home, office, and car' (Weiser and Brown, 1996). True to form, within a decade from this pronouncement computing interfaces developed from fixed locations of access to increased wireless connectivity. And it is predicted to become ever more ubiquitous in a manner that will dissolve connectivity into embedded environments (Greenfield, 2006). Greenfield considers this to be, in one form or another, an inevitability, and refers to this ubiquitous computing (ubicomp) paradigm as 'everyware': "Everyware is information processing embedded in the objects and surfaces of everyday life … the extension of information–sensing, –processing, and –networking

capabilities to entire classes of things we've never before thought of as 'technology'" [30]. This in turn is likely to trigger the 'always–on' surveillance of people in both public life and in private affairs. This inevitably blurs the boundaries between what is external and what is internal, and leads to forms of surveillance that turn inwards and emanates from the 'self' — an idea somewhat akin to that of sousveillance.

Sousveillance was coined by Mann (1998) who describes it as form of 'reflectionism' or as a 'watchful vigilance from underneath', which is a form of inverse surveillance. Yet it more than inverses the notion; it embellishes it with a self–reflective responsibility. For Mann, reflectionism "holds up the mirror and asks the question: 'Do you like what you see?'" (Mann, *et al.*, 2003). Also, in this form, it requires that surveillance is enacted as a form of self–control, as self–maintenance. It is the discipline of being inwardly secure; firstly vigilant towards the self; secondly towards other people/selves. This form of discipline seems to suggest that there is little room for negligence when watchfulness is the order of the day. Yet it also prompts the 'user' of sousveillance to be active and participate in the surrounding environment. Sousveillance, whilst it can encourage social responsibility, also suggests the need for the person to be guarded against unwanted intrusions and possible violations.

Mann went on to transmit, in the mid '90s, his daily life experiences for others to experience and interact with. This created opportunities for establishing a sousveillance network between Mann and his 'readers', or rather social network. This participatory/social panopticon into human–environment interactions was a forerunner to how 'wearable computing' might one day emerge as a form of modern 'intelligent image processing' (Mann, 2002). Mann's performance constructs a lived experience where the observation, recording, and dissemination of civic events have shifted towards a social panopticon, infiltrating daily physical encounters. It is a communal watchfulness of civil responsibility merged with a technical mandate for collective commentary, social analysis, and security of the self. It is also an enactment of performance ethnography, at the same time playful with notions of socialisation and breaching norms (Mann, *et al.*, 2003).

However, the question this raises, I argue, is whether social domains might not be in danger of becoming over–sensory realms, and what may emerge as the most convenient and/or efficient strategy for coping with this. Stross's (2002) essay 'The Panopticon Singularity' considers this trend in a dystopian fashion as 'the emergence of a situation in which human behaviour is deterministically governed by processes outside human control'. Stross argues, reminiscent of Foucault, that while the effectiveness of societal surveillance is dependent on the number of people involved 'systems of mechanised surveillance may well increase in efficiency as a power function of the number of deployed monitoring points' (Stross, 2002). In other words, as more people join the social panopticon, or sousveillant society, this will have a knock–on effect that encourages more people to join the securitisation of the self, rather than being left vulnerable and un–sensored.

There is no denying that such panopticon devices are proliferating — they are carried around with us, increasingly as our own willing appendages. The debates at present are largely centred on surveillance, as state practices of pervasive and ubiquitous top–down monitoring of civil space, rather than forms of self–monitoring, as in sousveillance. Perhaps the next step will be further towards practices of immersive surveillance and control, as indicated in this paper as a *psycho–civilized society*.

The current surge in research and development of wireless sensor networks is likely to have a significant future impact upon not only how the human body is configured in terms of

medical applications but, perhaps more importantly, how the human is cognitively configured in terms of the information–rich environment. One of the scenarios of ubiquitous, pervasive computing is to embed the environment with non–invasive informational systems that merge physical–digital infrastructures. Already much of our atmosphere is saturated with informational flows in various spectrum bandwidths — we are constantly walking through TV programs, mobile phone conversations, and even military broadcasts. Yet we are not decoding these transmissions. The transformation that these various scenarios in this paper suggest is that the human body is becoming re–configured — or re–wired — into a biological antenna. Not only will this greatly facilitate our access onto the Net but will also re–form the human presence, or identity, into a coded wavelength. A wavelength that is more readily readable to various technologies. This may seem far–fetched yet such a future may not be a far leap away.

Conclusion: The future a quantum leap too far?

Socio–technical evolutionary trends predict a future that is wholly immersed in and conversant with an integral informational–digitised environment. Informational flows are envisioned to go beyond the bits and bytes of present computing into the qubits (quantum bits) and subatomic circuitry of quantum computing (Schwartz, *et al.*, 2006). Researchers into quantum computing are working with subatomic spins for exponential and staggering computational capacity. A possible future may look a little like this:

> Inside the hatband is Sharon's communication center and intelligent assistant, which has scanned and sorted the 500,000 e–mails she received overnight. By the time she reaches the car, it has beamed the 10 most urgent ones and her travel schedule to her visual cortex. The text scrolls down in the bottom of her field of vision … . At the airport there is no ticket check–in or security line. Sharon simply walks through the revolving door, which scans her for dangerous items, picks up her identity, confirms her reservation, and delivers her gate number, all in the space of a second. (Schwartz, et al., 2006)

Perhaps the most common prediction prevalent amongst computer engineers is that computers — pervasive and non–perceptible — will be seeded and woven throughout the environment. They will be painted onto walls, on furniture and objects, inside the body, 'communicating with one another constantly and requiring no more power than that which they can glean from radio frequencies in the air' (Schwartz, *et al.*, 2006). Quantum researcher and physicist Stuart Wolf anticipates that the next two decades will usher in a type of communications he calls 'network–enabled telepathy'. Despite the fanciful name the method basically involves wearable devices (such as a 'quantum headband') sharing identity and downloaded information with others in the person's social network; and all driven by the power of thought alone. However, as Wolf points out, 'it will probably take a new generation raised to think of quantum headbands as normal for its potential to be truly realized' (Schwartz, *et al.*, 2006). Yet Wolf isn't alone in his thinking.

Princeton physicist Freeman Dyson has speculated upon the possibility of what he calls *radioneurology*. Radioneurology refers to a hypothetical future technology of observing neural processes inside a brain by means of locally deployed radio transmitters (Dyson, 1997). For this to be feasible, speculates Dyson, requires a technology to allow for the building and deployment of small transmitters inside a living brain similar to integrated circuit technology on a silicon chip:

> We know that high–frequency electromagnetic signals can be propagated through brain tissue for distances of the order of centimeters. We know that microscopic generators and receivers of electromagnetic radiation are possible. We know that modern digital data–handling technology is capable of recording and analyzing the signals emerging from millions of tiny transmitters simultaneaously. All that is lacking in order to transform these possibilities into an effective observational tool is the neurological equivalent of integrated–circuit technology. [31]

Given these speculations, and what has been discussed in this paper, it is likely that the major technology for the future is neurotechnology. The information age that emerged out of post–war technologies, and which has guided most of the technologies of the early twenty–first century, has made it possible to collect, utilize, and transfer information/data at unparalleled speeds. Communication, information, and data have been flowing at exponential rates. However, they are yet to merge into a systemic environment.

Neurotechnologies are set to change this with the rise of 'nanobiochips' and brain imaging and scanning technologies that will eventually lower the cost of neurological techniques and analysis as well as making the procedures efficient and profitable. Neurotechnologies, combined with wireless sensors, may possibly usher in a communications revolution greater than that caused by the arrival of the transistor and the microchip. Zack Lynch, executive director of the Neurotechnology Industry Organization (NIO), writes that 'When data from advanced biochips and brain imaging are combined they will accelerate the development of neurotechnology, the set of tools that can influence the human central nervous system, especially the brain' (Lynch, 2004). Although neurotechnologies are likely to be put to therapeutic and medical uses, such as for improving emotional stability and mental clarity, they also open opportunities for intrusive strategies of control and manipulation.

Part of this paper has been focused on the dangers of an increasingly wireless world. These dangers may include the potential for invasive technologies, based upon transmitted/received signals and wavelengths, to shift social order towards a psycho–civilized society. By psycho–civilised I mean a society that manages and controls social behaviour predominantly through non–obvious methods of psychological manipulations, yet at a level far beyond that of the 'normalised' social manipulations of propaganda and social institutions. What I refer to are the technologised methods of psychological interference and privacy intrusions in the manner of creating a docile and constrained society. And here this brings us back to the problematics involved in opening a Pandora's box.

In this paper I have asked whether innovations in wireless and neuro–technologies are not in danger of shifting human behaviour towards a psycho–civilised society, where greater emphasis is placed upon forms of social control and pre–emptive strategies. What are the moral and ethical implications of using wireless scanning surveillance technologies for evaluating pre–emptive behaviour based on thoughts and intentions alone? Is this not a dangerous path towards psycho–terrorising the social public? As Thomas (1998) reminds us, the mind has no firewall, and is thus vulnerable to viruses, Trojan horses, and spam. It is also vulnerable to hackers, cyber–terrorists, and state surveillance. Whilst this may sound a little too far out, they are reasonable questions to ask if technologies are racing ahead of us in order to better get into our heads.

Becoming wireless also means becoming increasingly immersed within an

information–saturated environment. From the evidence of present trends and developments it seems likely that a greater systemic interconnectedness and interdependence is being formed between human–object–environment facilitated through and by information flows. This may herald the coming of a 'wonderful wireless world', yet it may also signal unforeseen dangers in protection, privacy, and security of the human biological body within these new relationships. It is the suggestion of this paper that such issues and concerns need to become more public, visible, and open; the very opposite of these technologies.

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Notes

1. Dolman, 2002, p. 41.

2. O'Connor, 1993, p. 35.

3. *Ibid.*

4. See http://www.dia.mil/publicaffairs/Foia/foia.htm for list of declassified reports, accessed 11 November 2007.

5. LaMothe, 1972, p. 18.

6. Horgan, 2005, p. 67.

7. Horgan, 2005, p. 70.

8. Thomas, 1998, p. 84.

9. *Ibid.*

10. *Ibid.*

11. Thomas, 1998, p. 85.

12. Thomas, 1998, p. 86.

13. Simpson, 1994, p. 3.

14. Thomas, 1998, p. 87.

15. Thomas, 1998, p. 89.

16. Welsh, 1998, p. 37.

17. Part of ongoing research at the QinetiQ Group — see http://www.qinetiq.com/.

18. See http://crunchgear.com/2007/03/08/emotiv-project-epoc-sensory-gaming-for-the-masses/, accessed 15 January 2008.

19. http://emotiv.com/3_0/pr/pr022607a.htm, accessed 5 November 2007.

20. http://emotiv.com/3_0/pr/pr022607a.htm, accessed 5 November 2007.

21. See http://www.neurosky.com/, accessed 5 November 2007.

22. http://www.smartbraingames.com/, accessed 5 November 2007.

23. For patent, see http://www.google.com/patents?vid=USPAT6754472&id=30YSAAAAEBAJ&dq=6,754,472.

24. See Google patents http://www.google.com/patents?vid=USPAT4395600&id=V_ItAAAAEBAJ&dq=4,395,600.

25. See Google patents http://www.google.com/patents?vid=USPAT5507291&id=940lAAAAEBAJ&dq=5,507,291.

26. John 8:1–9.

27. See http://wearcam.org/mann.html, accessed 17 January 2008.

28. See also BBC Report — http://news.bbc.co.uk/1/hi/uk/6108496.stm, accessed 5 November 2007. For general information see the journal *Surveillance and Society*, at http://www.surveillance-and-society.org/index.htm, accessed 5 November 2007.

29. There are up to 4.2m CCTV cameras in Britain — about one for every 14 people — more than other industrialised Western states.

30. Greenfield, 2006, p. 18.

31. Dyson, 1997, pp. 133–134.

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