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National College of Art and Design

Fine Art (Sculpture)

VICIOUS TURTLES:

Stelarc and the Politics of the Nervous System

By

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INTRODUCTION

Technology Works its Biological Effects

Man has often had enough, there are actual epidemics of having had enough
(as in around 1342, at the time of the dance of death); but even this nausea,
this weariness, this disgust with himself - all bursts from him with such
violence that it becomes a new fetter.

Where does it come from, this sickliness? For man is more sick, uncertain,
changeable, indeterminate than any other animal, how does this come
about? Certainly he has dared more, done more new things, burned more
and challenged fate more than all other animals put together; he is the great
experiment with himself, disconnected, insatiable, wrestling with animals,
nature and God for ultimate dominion - he, still unvanquished, eternally
directed towards the future whose own restless energies never leave him
in peace, so that his future digs like a spur into the flesh to every point-
how can such a courageous and rightly endowed animal not also be the
most chronically and profoundly sick of all animals. (F. Nietzche, On the
Genealogy of Morals).

What makes a turtle vicious? Wound it, extrude each organ, one by one from its
shelter beneath the shell until the turtle's architecture flips. Anxious, its nervous
system exposed, vulnerable to an order that can play its nerves in public. For
Marshall McLuhan man has turned turtle. In *Understanding Media,* McLuhan
explains:

Throughout previous evolution, we have protected the CNS by outering this
or that physical organ in tools, housing, clothes, cities etc. But with each
outering of individual organs was also an acceleration and intensification of
the general environment until the CNS did a flip, we turned turtle. The shell

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went outside, the organs inside . . . Turtles with soft shells become vicious, that's our present state. (McLuhan, 1964, pg. 42).

Over thirty years later the brain has now become the central focus of a multidisciplinary inquiry. With neuroscience providing ever increasingly sensitive technologies for analysing, monitoring and directly intervening on the brain and cultural theoretics and artistic imagination uncovering their explosive implications, the CNS has become inextricably bound up with the rhetoric of technological progress. Aided by the advances in neuroscience, the quest to create artificial life and artificial intelligence opens up the possibility of complete integration between the computer and the human brain. The rapidity with which new texts on such advances are produced, and their mesmerizing potential hardly leaves us time to consider their implications, both positive and negative. Once the brain is coupled with and considered inseperable from such technologies, the question lies to the underlying motivation to understand human cognition in mechanical terms and beyond that, its implications for human autonomy. Here is where my inquiry lies.

If, like Marshall McLuhan we see the artistic imagination as an early warning system in sensing coming shifts in the technostructure, Stelarc's work may provide us with the questions that need to be asked if we are to accept the more disturbing aspects of neurotechnology along with its potential to vastly extend the range of human experience.

Having experimented with the limitations of the body over a ten year period of suspension events, Stelarc has developed strategies to augment its capabilities. Interfacing the body with prosthetic and computer technologies, he intends to alter its architecture, adjusting and extruding its awareness of the world. Stelarc claims that the body's agency can be extruded and its parameters extended through surrogate robots and other interfaced individuals that will collectively become the

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nodes and nexus of an external nervous system. As with the neurons that collectively form the biological nervous system, each body and android must have the freedom to effect each other and in turn be effected in a highly intrusive manner, one that certainly undermines current notions of autonomy. The purpose of this thesis is to investigate the avenues through which agency can be extruded. I will trace transmissions in the biological CNS as well as in artificial networks modelled on the brain and investigate particular attempts to intervene and direct these transmissions. In doing so I hope to offer a methodology that will access the implications of a realisation of the artists external nervous system, both in terms of the autonomy of its constituent units and the autonomy of the system as a whole.

In Chapter One I introduce the means by which Stelarc intends to extend human agency and awareness beyond what the artist considers to be its limiting physiology. Calling upon a virtual hand with a tactile sensitivity feedback mechanism, the artist asserts that artificial surrogates provide their users with a more enhanced vitality than their carbon others. Indebted to the theories of artificial life researchers, Stelarc sees vitality as something that can exist outside the material body. I will discuss the very concept of vitality and its importance as the point at which notions of artificial and human intelligences blur or separate.

Running with Stelarc's notion that there is at least a potential for vitality to exist outside the material body, Chapter Two discusses recent advances in artificial intelligence and the extent to which current capabilities could produce android agents that would alter their activators sense of reality.

Chapter Three explores various models of the central nervous system and artificial networks exhibiting processes anologous to those found in the brain. In doing so, I hope to discover how they might reflect on the working of Stelarcs external

nervous system. I look at particular attempts to intervene in the processes of both the brain and artificial networks, pointing to some of the dangers that constituent units of Stelarcs system may face.

In Chapter Four I look to the strategies employed by the American virtual community (considering that they are the units of the network from which Stelarcs conception of an external nervous system has developed) to evade supra-imposed control and regulation. A similar methodology employed by Stelarc's agents may provide some protection against intervention and imposed direction.

Finally, I look to understand the motivation behind the creation of such a system. The struggle to apply new strategies of emancipation to an already complex rhetoric of control might conceal an individual desire for power. Insiduous as these forms of power are, it may be that in our unwillingness to recognise them, they find free reign.
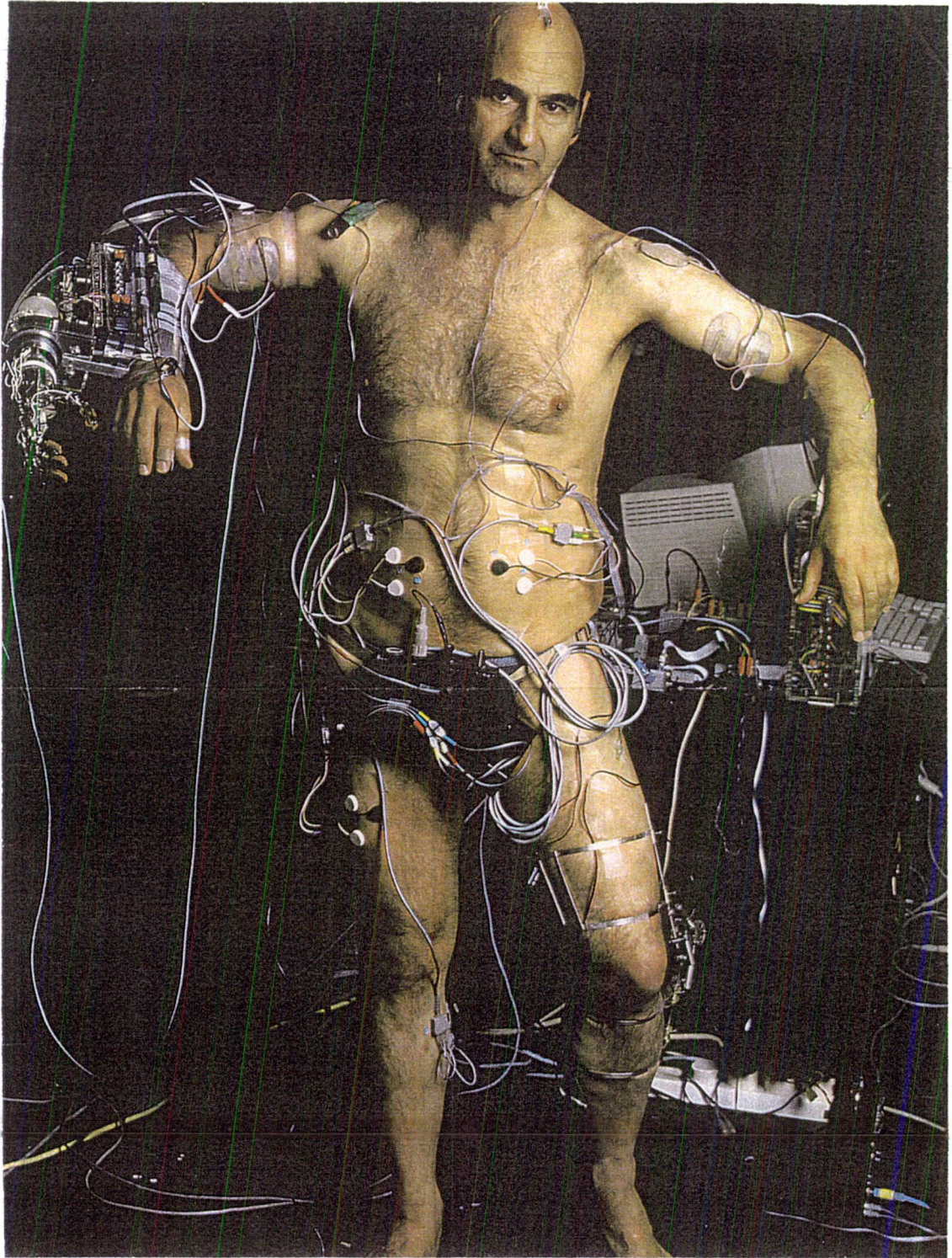
Figure 1, Vicious Turtle? Host Body, Stimboid System, 1995.

CHAPTER ONE

Extended Body: Situating the Self Beyond the Skin

In this age of information overload, what is significant is no longer freedom of ideas but rather freedom of form - freedom to modify. freedom to mutate your body. (Stelarc, 1984, page 76).

On the 8th of may 1994, Stelarc delivered a paper entitled *Phantom Bodies, Images as Agents in Virtual Realty Environments* to an audience at the University of Warwick, Coventry. The artists introduction enthusiastically proclaimed:

The experience of Telepresence becomes the high-fidelity illusion of Tele-existence . . . It meshes the body with its machines in ever-increasing complexity and interactiveness. The body's form is enhanced and its functions are extended. Its performance parameters are neither limited by its physiology nor by the local space it occupies. (Stelarc, 1991 page 594).

In translating this idea into an artistic strategy, Stelarc conceived of a virtual arm or phantom limb which he activated in a performance entitled *Event for Phantom Body*. (The Open Stage, Melbourne, Australia 1994). Throughout the even Stelarc wore data gloves which are equipped with a position - orientated sensor facility. The artist used a gesture - based command language (Fig. 2) to allow for real time operation of the carbon limb's computerised image. The virtual arm functions through a computer system called Stimboid which allows the real arm's gestures to be mapped onto its virtual image. Each mode of action that the imaged limb can reproduce is enhanced by its own parameter, one allowing computerised elaboration of the real limbs movement. Each parameter allows for amplified

GESTURE RECOGNITION LANGUAGE
VIRTUAL ARM OPERATION - LEFT HAND DATAGLOVE

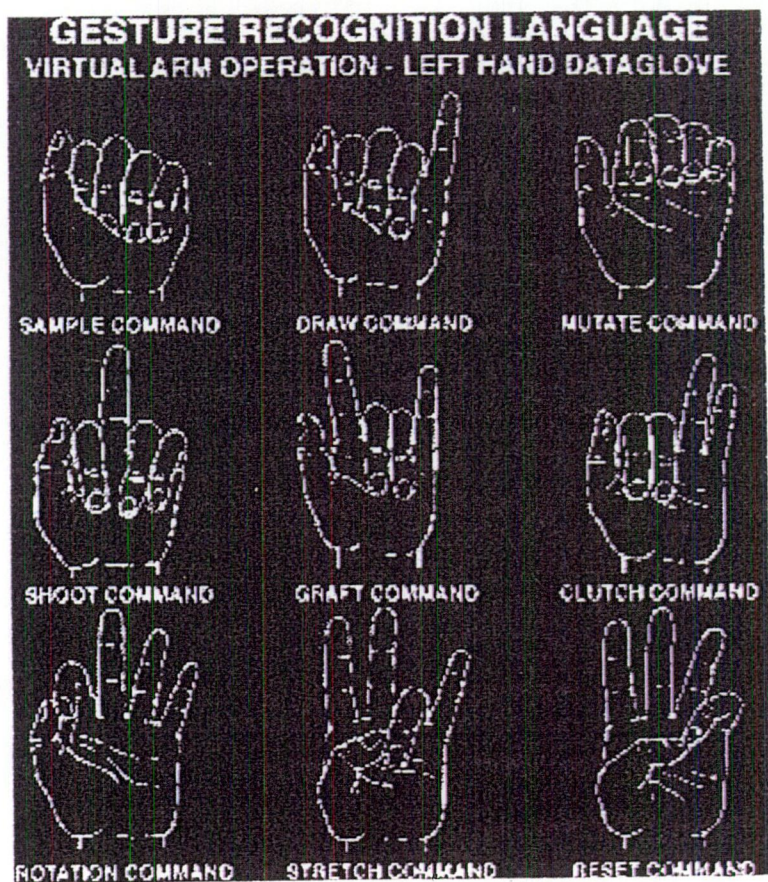| SAMPLE COMMAND | DRAW COMMAND | MUTATE COMMAND |
| SHOOT COMMAND | GRAFT COMMAND | CLUTCH COMMAND |
| ROTATION COMMAND | STRETCH COMMAND | RESET COMMAND |

Figure 2: Gesture Recognition language for Virtual Arm, 1994.

capabilities, including extensile limb and finger segments and the grafting of extra hands onto the virtual limb. The real arms workings can be looped or sampled, generating more complex and speedy movement in its image.

Stelarc incorporated a clutch command facility into the data gloves that can stall the carbon limb's movement, disengaging the simulating hand from non specific real limb motion. The system reads a shake or shudder in the carbon limb as an involuntary action and exhibits a refined translation of the real limb's intentions in virtual space. The intervening system thus demonstrates a degree of agency over the interaction in the same inconspicuous manner by which the brain will make an informed decision to pick up an object in a particular way[1].

The artist compiled a language of gestures that can be simply performed by the real hand but at the same time activate more delicate manoeuvers in the virtual limb. So for example, the clumsy human hand trying to thread a very tiny needle can be afforded the precision with which it feeds a rope through a basketball hoop. With its refined interactional aptitude the imaged hand responds more sensitively to its environment.

The artist sees this evolutionary strategy as a complement of natural evolutionary processes where the small scale infinitely reflects the large scale. He argues that

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[1] Beyond the artistic imagination and scientific speculation, computer systems that can simulate certain cognative functions have found practical applications. The German Ministry for Education, Research and Science has recently approved the Neurotechnology Project aimed at the development of a neuroprosthesis for quadriplegics. Scientists are refining a device which is used to relay motor impulses from the brain, bypassing damaged neural pathways, thus instructing the limbs to walk again. While Stelarcs movements are improved via an external hook up to the virtual limb, the activating system in the Neurotechnology Project will be implanted in the patients brain. Initial plans foresee using a body suit which like Stelarcs data glove will be equipped with electrodes effecting the motor system. The neuroprosthetesis is intelligent in itself but it also fits into the wider context of being a constituent part of the patients cognitive functions. I will discuss the implications of such android agency in the next chapter.

this amplified sensitivity will enable us to experience "space/time realms perceptually veiled from our present physiological perspective and will eventually produce "a telematic scaling of the senses" (http:// www.merlin/com/ au/stelarc/fracfles/fracfles.html). Stelarc sees the imaged limb as possessing a more enhanced vitality than its carbon ancestor.[2] He imagines the former being developed into a surrogate robot that would create a "kinesthetic feel," providing the sense of orientation, motion and body tension in its biological ancestor. Stelarc sees vitality existing outside the carbon body, a notion he shares with Artificial Life researchers.

In his book *Artificial Life* Christopher Langton explains that research in this field is grounded on the assumption that the "logical form" (Langton, 1989, page 335) of an entity exists apart from the material body that expresses it. Vitality resides in the former not the latter. Stelarc sees freedom of form as an important evolutionary concept, one that moves identity from within the fixed parameters of the skin to a less clearly defined, more extended space.

Resonating through the artist's Phantom Body performance is an assumption that has survived since its origins in Platonic philosophy right through to the present day - the privileging of form over matter. In *Virtual Realities and their Discontents,* Robert Markley traces cyberspace's indebtedness to Platonic philosophy and its logocentric past. Markley argues that at the heart of cyberspace lies a fundamental belief in the mathematical structure of the world, in the computability of the universe (Markley, page 58, 1996). The privileging of form as prescription over

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[2] It must be stressed that this enhanced vitality flourishes in Cyberspace rather than Newtonian space. Considering that this thesis attempts to deal with the complexities of individuality, identity and autonomy of a being whose most intimate organ has become exposed to the intervention of others, it is important to see the virtual limbs potential as the motivation behind Stelarcs conception of an operational being, one whose parameters are extended, not through its computerised image, but through interconnecting physical bodies, existing in real space. I will detail this further in Chapter three.

matter as a given finds its equivalent in the privileging of mind over body. Although Stelarc himself verbally undermines the logic of separating mind and body:

> When I talk about the body, I don't mean it on a counter distinction to a mind. For me a body is this total phenomenological cerebral package . . . Mind for me is this sense of operating in a world, of navigating through space, of force-feedback, of tactile sensitivity
> (http:// www.to.or.at/stelarc/interview.01.htm).

But the body that he talks about is not one that is fixed in a particular space by its fleshy parameters. Whether it be through silicon prosthetics directly attached or remotely activated, the body's dispersibility makes it more and more conceivable as a pattern rather than a presence. For Stelarc body and mind exist as a package, but a package in which the only remnant of a traditional concept of the body to be found is in the materiality of silicon . It is only through the decarbonisation of the body that the artist repudiates the Cartesian mind/body split.[3]

What is clear in Stelarc rhetoric is how greatly the brain remains in all of its functions bound to and orientated towards a body. The latter, however, has no value in itself if it can be completed, complemented and even replaced. Very much in the tradition of the castigation of flesh by religion (where the body is seen as the prison of bounded potential), Stelarc's artistic strategy stands for the possibility of gradually separating the self from its carbon seat and transferring it to new carriers. In an Internet interview Stelarc was asked if he considered the human

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[3] In the context of the body being theoretically conceived as a site of resistance,e its perception as a pattern leaves it, like the turtle with its shell removed vulnerable to outside intervention and control. I will discuss the turtles method of defence and the motivation that drives the artist to desire a "disembodied" future in Chapter four and my conclusion.

being to be something more than a physically embodied presence. The artist replied:

> Well I think its about seeing the body in a different way, instead of the body being a biological entity operating in local space proximal to someone else, in fact the body becomes a body connected to other boies in other places in a multiplicity of ways (http:// www.to.or.at/stelarc/interview/01.htm).

Stelarc sees an essence distinct from the body's biological materiality and extractable from it, a belief he shares with traditional spirituality. The artist's connection with the latter is further strengthened by his conviction that our carbon chemistry is the cause of the human's increasingly degraded position, albeit in the face of technology rather than God. Stelarc describes our bipedal breathing body with its 1,400-cc brain as an inadequate biological form.

> It malfunctions often and fatigues quickly, it is intimidated by the precision, speed and power of technology. It is susceptible to disease and is doomed to a certain and early death. (Stelarc, 1991 page 591).

In a theoretical context the term form resides within a definition of information when the latter is described as a probability function or pattern. In her essay *Narratives of Artificial Life,* N. Katherine Hayles explains how Thomas S. Ray, an evolutionary biologist designed his software program Tierra, a project like Stelarcs which resulted from the creator's frustration with the slow pace of natural evolution.[4]   Hayles describes how Ray created evolvable artificial organisms

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[4] Another frustration that is rarely voiced by Artificial Life researchers is the powerlessness experienced in the face of natural forces. More reticence still surrounds the notion of omnipotence associated with creation. I will discuss this further in my conclusion.

within Tierra and released them on the Net so that it could breed diverse life forms. Hayles explains that in Artificial Life programs, the recognition of pattern is associated with the perception of presence. For example when the pattern of a dark blob is recognised as a moving creature, the latter becomes every bit as alive as a human. Aliveness is independent to the medium, in this case computer screen pixels.

Hans Moravec, head of the Carnegie Mellon Mobile Robot Library and author of *Mind Children: the future of Robot and human intelligence,* argues that identity is essentially a pattern rather than a materially - embodied presence. Abstract the recognisable form into an information pattern, download it into a computer, then within that computer lies the essence of humanness. Moravec like Stelarc believes that the reign of carbon-based life forms is nearing its end. Outmoded by the superior functionality of its machines, Moravec believes that the future prospering of humankind lies at the mercy of its decision to forge its material basis. For Moravec the human must be incorporated into the machine, for Stelarc the reverse seems a more realistic option.

In his book *D'escartes; Error: Emotional Reason and the Human Brain,* Antonio D'amasois describes the complexity and importance of feedback loops connecting the body's physical systems with ideas that are processed in the brain. Moravec denies the importance of physical sensitivity, Stelarc celebrates it but only when this sensitivity is mediated and eventually experienced by non carbon-based life forms. Moravecs "mind children" may exist as identities but to what extent will thee identities be conscious, or more to the point self-conscious? To what extent can silicon produce consciousness? Would self-consciousness be effected when

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experience is mediated through silicon prosthetics? If the nervous system is to be extruded through technological prosthetics how will it effect the personality, behaviour and autonomy of the individual subject?

CHAPTER 2

Android Agency: Kinesthetic Action/Kinematic Motion

Electronic space restructures the body's architecture and multiples its operational possibilities. The body performs by coupling the kinesthetic action of muscles and machine with the kinematic pure motion of the image it generates

(http:// www.merlin.com.au/stelarc/phantbod/phantbod/html).

Stelarc believes that teleoperational systems make it possible to project human presence in remote locations. This presence will manifest itself through semi-autonomous robots, capable of intelligent disobedience. Such robots, the artist claims, will function like the virtual arm, producing phantom sensations in their activators. (Fig 3). The androids in effect become extensions of the body. Wires connecting the former to the latter act as sensory and motor neurons, sending signals from the body to activate its robot surrogate and from the surrogate to the body creating phantom sensations in the latter If the artist sees consciousness as something that can arise out of processes experienced by silicon beings, who will be responsible for the actions carried out in these remote locations - the activators or their robot surrogates? Will what Stelarc calls the "kinematic" motion of the androids shift accountability away from human operators? To what degree will the intelligence of these surrogates influence their autonomy?

In the context of computer science Nadia and Daniel Thalmann have defined autonomy as the capacity of a system to maintain its viability in various and changing environments. (Thalmann, 1994 page 4).
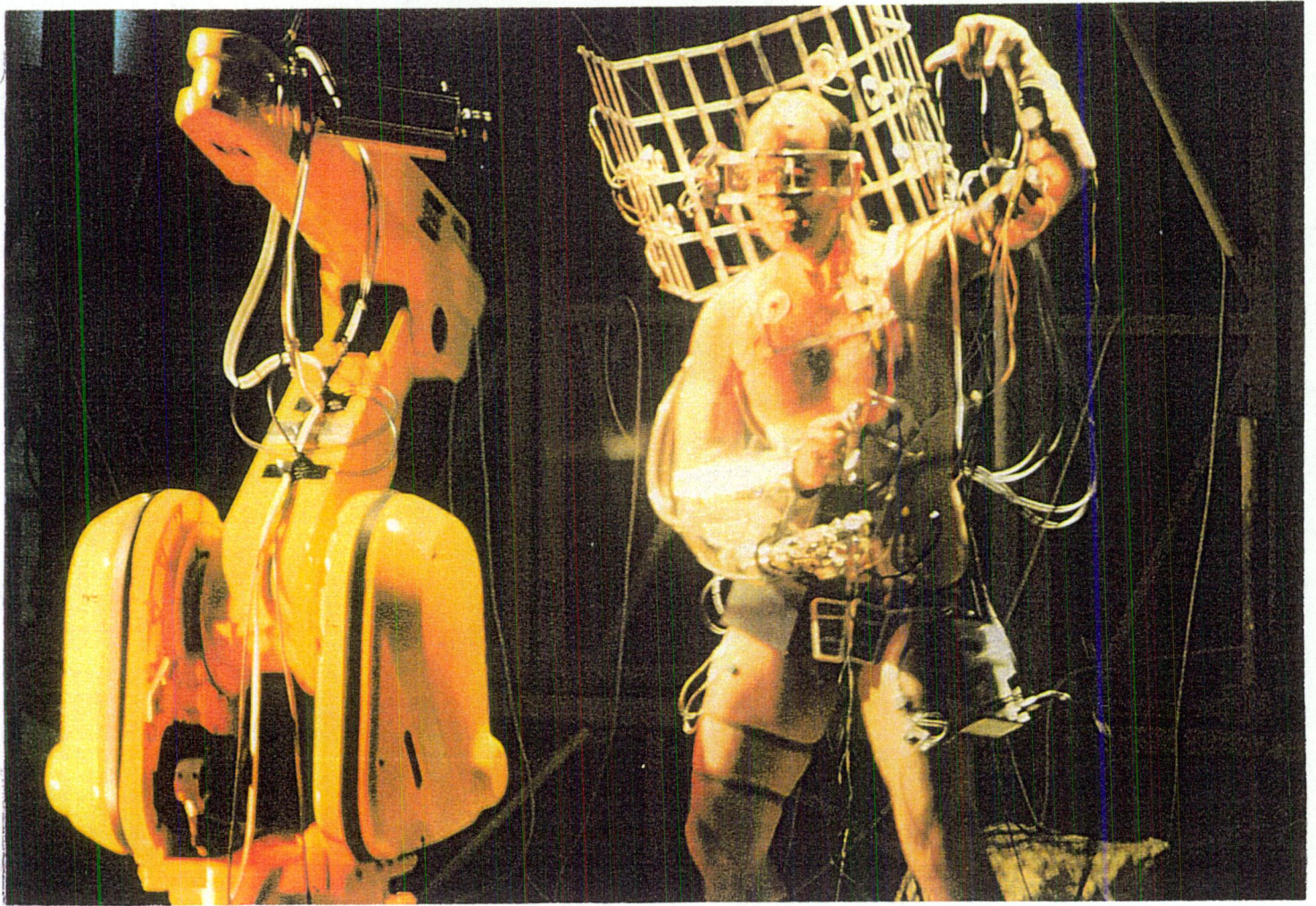
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Figure 3, Scanning Robot, Automatic Armand Third Hand, 1992.

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In order for a system to exhibit some autonomy it must have an understanding of its position in relation to its environment. In other words it must exhibit some degree of intelligence. Alan Turing has explored the nature of cognition in a paper entitled *Computer Machinery and Intelligence* where he proposed an objective test for machine intelligence. The experiment, later named the Turing Test involves a human interrogator, a human contestant and a machine contestant. The objective of both the human and the machine is to convince the interrogator that they are human. If the machine is smart enough to simulate human cognition, then by Turing's criterion it is declared intelligent. "If an android A passes the Turing Test, then A is conscious (= thinks . . .)". (Bringsjord, 1995 page 950.

But as Norman Crowther has pointed out, the debate hinges on definitions of "is conscious", "thinks", has "intelligent behaviour" (Crowther, 1996, page 130).

The relationship between these terms have been greatly contested between those who believe that machine intelligence structures can imitate human intelligence structures and those who argue that such structures are merely rule-following and have no implicit understanding of the world comparable to that of a human.

Although the Turing test was conceived in 1950, it was not until 1991 that the first experiment actually took place. Hugh Loebner, a dance-floor manufacturer, offered $100,000 to the first person who could devise a program that would fool ten interrogaters during three hours of unrestricted conversation. It soon became apparent that this was beyond current capabilities, so Loebner set up a yearly prize of $2,000 that could be claimed by the programmer whose system seemed "most nearly" human. In his essay *What's it mean to be Human Anyway?* Georgeann Deen describes the experience of taking part in the 1995 test. He participated as a human contestant and experienced the paranoid dilemma of whether to try and convince the judge that he was human or relax and let his

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work for him. Deens dilemma perhaps points to the increasing anxiety felt by humans as the cognitive abilities of their most valued and intimate organ are being transferred to "alien" carriers. However Dean, in fact, had no need to worry. Much to his surprise Deen was rated the "most human human". By being "moody", "irritable" and "paranoid", he came out way ahead of the other four contestants. None of the computer programs was smart enough to convince any of the judges that it was human. The winning entry's chosen topic of conversation was sex. Although it gave quite generalised answers it managed to keep within the realms of the questions asked.

Extract:

Judge: Whats the most effective form of cotraception? (note the misspelling)

Program: I can not give you an answer to that.

Judge: I meant what's the most effective form of contraception?

Program: The most effective form of birth control is the inter-uterine device or IUD. In the first year of use six per cent of women who have an IUD installed become pregnant. Much of the effectiveness of the IUD results because it does not require any further action on the part of the woman once it is in place. (Dean, 1995, page 81).

Although the winning entry could not convince the judges that it was human, does the fact that it could at least communicate its misunderstanding mean that it has its own representation of reality? Margaret Boden claims that an android does achieve its own sense of reality, for she argues that it can be creative. Drawing on Immanuel Kant's definition of creativity as a "modification of established rules"[5]

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[5] While Kant argues that creativity is a modification of established rules, he asserts that genius is the overthrowing of established rules and the setting up of new ones. The significance of this in relation to Stelarc's proposed new body as an external nervous system will be discussed din my conclusion.

Boden believes that the ability to communicate something that relates to the android's own understanding or misunderstanding makes it creative.

If Stelarc's "semi-autonomous" robotic surrogates have their own sense of reality, then their activators autonomy becomes increasingly diluted in the process of remotely activating his/her intention. In his book Ourselves and Computers: *Differences in Minds and Machines,* Aart Bijil argues that autonomous technologies are driving us to become deficient in our very beings. (Bijil, 1995 page 200). The sensory impulses we receive from these agents are second hand, mediated and altered by an androids own decision making. The danger here lies within the fog that surrounds computer intelligence, consciousness and autonomy. It is worth noting again that these androids become a constituent part of the activators nervous system, the seat of our individuality our identity. Although Stelarc would dismiss my caution, the artists work is greatly influenced by cognitive scientist Marvin Minsky who models the mind on a society colonised by agents with their own limited autonomy.[6] The artist sees his androids as an externalised robotic version or these agents. My concern lies with the very externalisation of such agents. The androids must first be programmed and this may be forgotten in the rhetoric of autonomy and intelligence. Secondly the program is always vulnerable to outside intervention in the same manner by which computer hackers can inconspicuously intervene on private computer progams. On the one hand a society of brainwashed individuals could emerge, on the other a society of increasingly paranoid (to the point of inactivation) units may develop.[6(1)] Such technological developments necessitate a disolving of the linkage between

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[6] I will discuss this in greater detail in Chapter 3.

[6(1)] My concern about brainwashing lies in the fact that an android could be progammed to experience a particular reality. The android's experience would be fed back to he individual as a representation of the latters own reality. The individual may act in accordance to their mediated experience, or on the other hand a situation may arise where individuals do not trust their own senses and would not act on them.

the warranted self and its politically authorised coupling with the biological body that is already taking place in the late twentieth century. Would this dissolve be affected if semi-autonomous carbon bodies took the place of the robots and would control achieve a more insiduous role if their activators too became incorporated into a network of semi-autonomous bodies?

CHAPTER 3

Stories from the Nervous System

In Stelarc's *Split Body: Voltage - In/Voltage Out,* (Fig 4) the body's agency is amplified, not through prosthetic surrogates but through real carbon bodies. The performance which took place at the Gasworks in Melbourne, Australia on the 24th of November 1994, involved a new application of the Stimboid software package. As well as allowing for the remote activation of virtual bodies, the system could now actuate real body movement. Through a touch screen interface the audience can programme Stelarc's movements. Participants are provided with a computer screen on which appears an image of the artists body (Figure 5). A set of numbers are superimposed on six points of the virtual body. Clicking on a number will actuate a movement in a corresponding site on the artists real body. Clicking on the same site will stop the stimulation. As with Stelarc's virtual limb, a sequence of motions can be replayed continuously using a loop function. The user can also paste sequences together from a library of gesture icons. An improvised function allows random motions to be superimposed. The system allows for a visual simulation of the instructed movements before stimulation occurs in the real body. With the artist's prosthetic third arm attached, the stimboid software results in a split body, with the audience controlling the left hand side (voltage-in) and the artist himself directing the third limb which is positioned on the right hand side (voltage-out).

At the later Teleoplis event in Luxembourg (November 10th 1995) Stelarc's "host body" was simultaneously connected to systems at the Pompidou in Paris, the Media Lab in Helsinki and the Doors of Perception conference in Amsterdam. Downloading the system on the Internet allowed stimulation to be activated from these sites. During the same month the artist released the Tele-Stimboid Manual

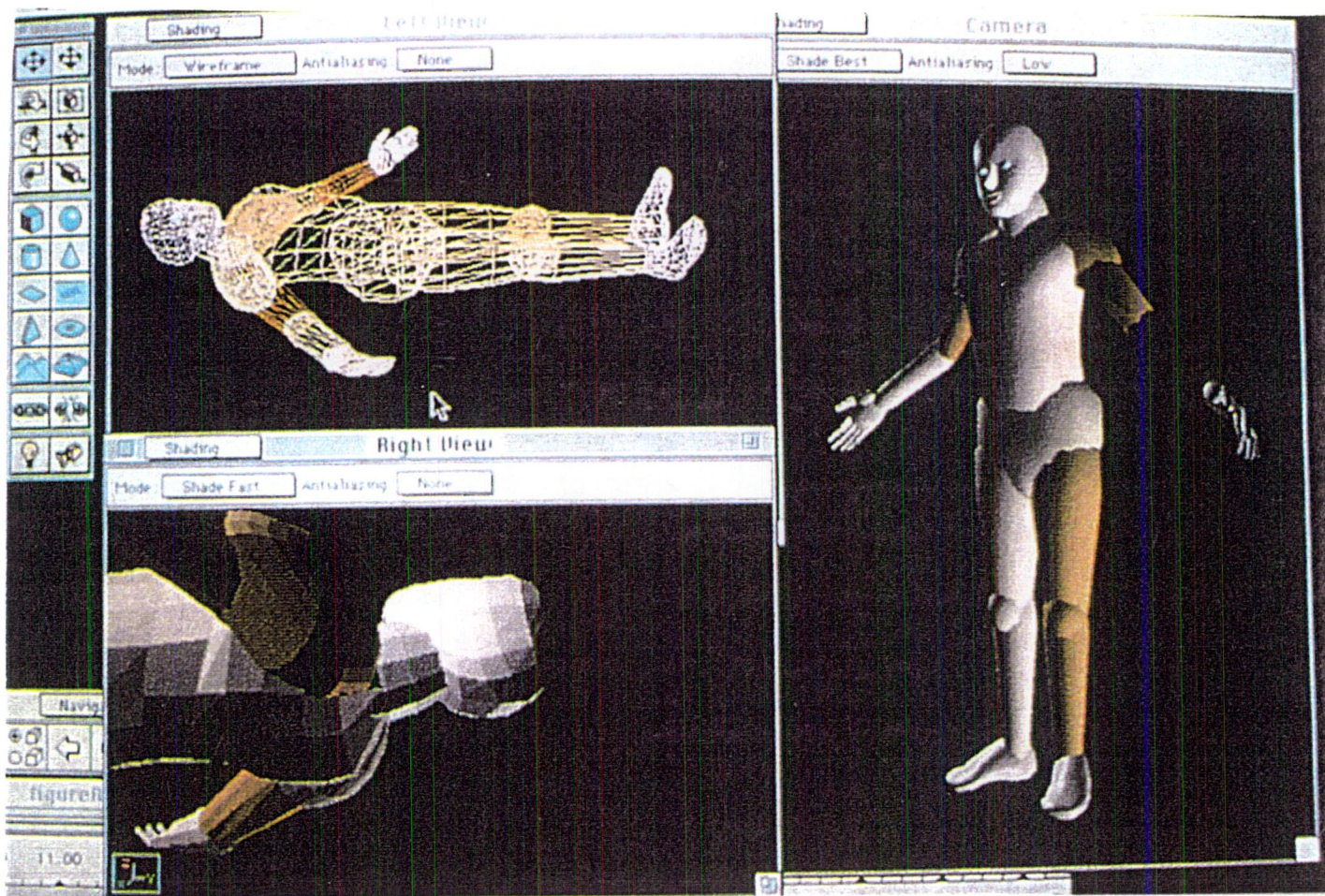Figure 4: Split Body: Voltage In/Voltage Out, Third Hand, 1993.

Figure 5, Touch-screen interface for muscle stimulation.

on the Net in expectation of a time when his body could be activated by anyone who has access to an on-line computer.

Stelarc sees the stimboid system as a means by which a motion is displaced and repositioned from one body to another in a remote location. In his Fractal Flesh paper the artist imagines

> a body whose authenticity is grounded not in its individuality, but rather in the mulitplicity of remote agents that it hosts.
> (http:// www.merlin.com.au/stelarc/fracfles/fracfles.html)

Stelarc imagines the Internet as an external nervous system connecting bodies that becomes its nodes and nexus. He thus creates a society true to Marshall McLuhan's description of one on which technology works its biological effects. "We turned turtle, the shell went inside, the nervous system outside . . . thats our present state (McLuhan, 1969, page 42).

According to the artist each body becomes part of the extended parameter of an operational being that interacts with its environment with increasing complexity, sensitivity and intelligence. In describing the experience of being a split body, Stelarc explains that during the performance he was struck by the strange metaphysical experience of watching his limbs move on their own. The artist has created a situation whereby an individual can be automated to make a movement which is no longer initiated by the individual's own desire or expectation. It is not surprising that this remote body actuation has been termed cyber-voodoo in many Internet accounts of the Split Body performance. Stelarc however, argues that a subject who relinquishes partial control over his/her physicality is no less subservient than the body that is controlled by less conspicious modes of

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oppression.[7] In an optimistic look into the future of his system, Stelarc imagines a situation where all bodies share the potential to prompt or be prompted. Parallel distributed connections will be made, through the axon's synthetic other right across the net. These connections will form a being whose intelligence and form emerges out of piecemeal activities rather than from the application of a governing plan.

Stelarc has appropriated a design method named in computer processing circles reverse engineering and which is theoretically known as connectionism: it uses parallel distributed processing to match the non-locatable ego in the human brain. One of the earliest uses of the term connectionism was in relation to studies on the natural intelligence of human beings. In this 1949 book *The Organisation of Behaviour* Donald Hebb describes the brain as "a complex system of multiple and parallel associations bereft of any centralised control". (Hebb, cibed in Plant, 1996 page 206).

Explaining the behaviour of cell assemblies he uses the term connectionist to dispute the notion of the brain as a given organ. Instead he proposes that the brain is an emergent system which is altered every time neurological connections are made. Based on a neurological hypothesis, that is on the premise that the nervous system consists of physically separate, essentially homogenous cells or units which transmit information primarily by electrical means, the rhetoric of the Internet as a "self-evolving" system ensures that the veil between synthetic networks and carbon-based networks become increasingly transparent.

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[7] In the Slit Body performance the artist's movement is activated by 30 volts of electricity, creating a heightened awareness of outside prompting. Many recent theorists view individual's experience of their own bodies as socially constructed over and against other approaches that hold the body to be ontologically present sto itself. Stelarc considers the notion of free agency to be highly problematic, he stresses: "one can well argue that any individual tought has in fact been manufactured by countless external forces impinging on your body" (http:// www.to.or.at/stelarc/interview.01.htm).

The exploration of emergent order is based on the notion that a group or multitude of simple units can generate complex phenomena "accidentally". Nicholas Negroponte, columnist on Wired magazine and director of the Media Lab, Massachusetts considers the Internet as a remarkable example of a system that has evolved in the absence of an external designer. Sadie Plant, author of *The Virtual Complexity of Culture* has also argued that complex interactions on the Net proceed without any "transcendent guides" (Plant, page 210, 1996), whether they take the form of a central processing unit or a human governor. Stelarc sees potential for his new network of bodies to create complexity by similarly emergent means. Speaking of connectivity he suggests:

> Its in these interfaces, in these operations and exchanges that intelligence and awareness is generated, not simply form an isolated body.
> (http: // www.to.or.at/stelarc/interview.01.htm).

Like all emergent systems, Stelarcs new operational structure manifests itself as one which evolves from the bottom up - each individual body acts as an agent whose interaction with other agents develops into a "body" with a more complex, extended awareness of its environment. In his Fractal Flesh paper Stelarc describes a scenario where "agency becomes shared in the one body or in a multiplicity of bodies." (http: // www. to.or.at/stelarc/interview.01.htm). Mark Poster has argued that there is substantial political force in bottom-up theories as they implicitly oppose authoritarian power structures which Top-down notions of intelligence reinforce.

Studies of complex systems including the brain have influenced a resurgence of the notion that evolution and learning are co-dependent. Sadie Plant points out that there is no distinction between what we call learning and the exploratory process

which cuts through all intelligent behaviour. She argues that such a mode of learning implies that intelligence cannot be confined to a few just as it cannot involve everyone. Such a learning process, she explains is the activity of emergent systems where once separated lines and modes of research interact with one another (Plant, page 121, 1996).

Stelarc's proposed "recursive being" exists for now only in the artist's imagination, therefore it is important to look at emerging systems that exist in the present to develop a more concrete understanding of what being a unit in such a system implies for the individual body. Ted Nelson's Xanadu system, an on-line global library, exists as a close analogy. The arrangement of this library is configured by the users themselves, not by some governing body. Connections that are continuously made between the user and particular units of information become prominent in a similar manner to the way in which particular synaptic connections in the brain are reinforced through continuous usage. In such a case the body of the book is altered, configured by the user as he makes a trail of his interests from the text available to him. What were once separated lines of research begin to interact and form a more complex textual structure. The body of information that arises from parallel explorations of the library emerges in a more democratic manner than its binded ancestors. In the same way bodies as nodes of a nervous system would interact not by predetermined rules but rather by the variable connections that occur during parallel explorations of a distributed system. In an Internet interview Stelarc postulates,

> Say in this system where we electronically connect bodies, what happens if I make a movement in Melbourne prompting you to make a movement in Vienna, a motion that begins in my body is completed in your body in

another place. You become a host for my behaviour from Melbourne, I can

extrude my awareness and action into another body elsewhere.

(http: // www.to.or.at/stelarc/interview.01.htm).

The artist has created a scenario when the growth and self-regulation of his external nervous system is ensured by the oscillating autonomy and heteronomy of its constituent individuals. As I have mentioned before Marvin Minsky models the mind on a kind of society colonised by agents with limited abilities. Each agent taken individually, operates only on small-scale problems. They conjoin into agencies when more complex problems arise.[8] Minsky describes a cooperative community that would appear to contradict the basic tenet of my thesis, that is the extrusion of the nervous system, its coupling with technology and the rhetoric of decentralisation and cooperation that surrounds it is inconspicuously if not insiduously political.[9] The technical imperative in human experience creates anxiety,[10] the anxiety felt by McLuhens "vicious turtles" when their nerve chords

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[8] Although this is a model of the mind, it is inspired by Hebbs fresh look at the brain.

[9] As Neil Smith has pointed out, "Nature is as established threnchant and powerful weapon in 'western' discourse . . . The authority of nature as a source of social norms derives from its assumed unsuceptibility to social manipulation" (Smith, page 41, 1996). From pre 19th century conceptions of the brain as a "given" organ to Hebbs emergent system and Edelmans ecological system, models of the brain have been constructed by particular technological instruments and individual's specific lines of enquiry.

[10] A survey, carried out by the Emnio Institute in 1993 investigated the general public's concerns regarding the applications of neurotechnology to human-machine interface. Eighty per cent of respondents believed that brain research should only be carried out under strict ethical codes. Forty per cent found the concept of brain-computer interface thoroughly unacceptable. In its application to extending human consciousness fifty per cent considered neurotechnology to be an ethically unsuitable treatment of the organ that represents the "seat of the soul" (Rotzer page 202, 1996).

The alarm surrounding the integration of technology and the brain is bound tp a moral and ethical discourse. Issues of biological health are largely ignored. In 1976, scientists in the American Environmental Protection Agency demonstrated that exposure to weak levels of electromagnetic fields could slow the outflow of calcium in cells from chicken brains. Several other studies shave shown that types of lukemia, lymphoma an cancer of the nervous system are linked with exposure to residential power lines and household appliances including the computer screen and the lowly electric blanket. Intervention by way of smart drugs and psychopharmaceuticals invite a an accepting reticence. So it seems that issues of control are the primary concern, especially when one can trace its pathway to a body of individuals who do not represent a particular moral standard or known agenda.

are played in public However, if we look to Gerald Edelmans model of neural processes, a more competitive society emerges.

In his book *Neural Darwinism,* Edelman proposed that he nervous system works as a selective system with processes analogous to natural selection in evolution. Just as certain species particular to the processes of natural selection arise, neuronal groups particular to the exploratory process of learning arise. DNA, genetics and heredity determine whether a species will succeed or become extinct within their environment, particular exploratory processes that strengthen or weaken synaptic connections between cells determine the prominence of certain neuronal groups within the nervous system.

If Stelarc's new being exhibits the properties of an ecological system, then surely as Leir H. has suggested in the *Construction of Perception,* such a system's large population of units might be expected to display competitive behaviour similar to those seen in ecology (Finkel, 1992 page 398). Such behaviour has been evident in computer simulations of large cortical networks and has more recently been discovered in the workings of in vivo cell cultures. The application of Edelman's Nueral Darwinism theory to Stelarc's extruded nervous system would imply a scenario where individuals who do not frequently engage in the exchange of agency become increasingly recessive to the point of extinction. It is important that within this Darwinian discourse the social determinations that locate individuals on different sides of the electronic frontier are not forgotten. In his essay *Supernatural Futures,* Sean Cubbit explains that in 1995 an estimated 80 per cent of network traffic was travelling on corporate communication lines. Seventy per cent of the world's computers are concentrated in the northern hemisphere, a great majority of hardware and software manuals are dominated by the English language and the logic and architecture of a vast number of computers approximate to the needs and hierarchies of corporate bureaucracies. It is a worrying reality that the actuation of

Stelarc's project would normalize or naturalize a de-evolution of the poor and indeed cultures that are technologically behind the first world. The importance of this reality deserves a line of enquiry that is beyond the scope of my thesis. Considering that my particular concern lies within the implications for those individuals who are constituent units of Stelarcs system, it is important to note that Net users themselves are also located differently[11] and beyond the struggle for dominance (as predicted by Edleman's theory) between essentially homogenous units, their exists another threat from the scientific/political methodology that has, in the past found justification in destroying certain areas of the brain for the purpose of curtailing anti-social behaviour.

Foreign Bodies

With the expansion of knowledge in the field of neuroscience, scientists have achieved a good understanding of how the brain works and how it may be manipulated (both positively and negatively). Neurological intervention by the likes of Egas Moniz (1930s) and Japanese neurosurgeon H. Narabayashi (1960s) was directed towards keeping dangerous, anti-social impulses of the public-at-large under control. Electro stimulation has been used for the purpose of intentionally destroying brain tissue in the case of patients with severe psychiatric disturbance. In 1969 Dr. Jose Delago, inventor of the stimoceiver implant and author of *Physical control of the mind: Toward a Psychocivilised Society,* advocated using electro stimulation as a means of social management. The stimoceiver was conceived to employ high-voltage wireless electric currents to destroy areas of the brain that were thought to be responsible for deviant behaviour.

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[11] I am talking here of private access and operation through relatively cheap technologies and government and bureaucratic operation which is neither restricted or limited by expense.

The stimoceiver is a mid-depth electrode which can receive and transmit electronic signals over F.M radio waves. By activating a correctly-positioned stimoceiver, an outsider can wield a degree of control over the implanted subjects response. The most famous example of the implant in action occurred in Madrid. Delago "wired" a bull before stepping into the ring with the animal. Having been gorged and provoked the bull charged with frenzy and then stopped, just before reaching Delago. The latter had halted the animal by simply pushing a button on a box in the palm of his hand. Delago prophesied a day when such brain control could be turned over to non-human operators by establishing two way radio communication between the implant and computer. The explosive implications of the stimoceiver in relation to Stelarc's nervous system are twofold.

Firstly the nervous system (for now) is accepted to be a self-evolving system. The

acoustic fields and optics.[12] Rather than resorting to the lethal solution offered by the stimoceiver,[13] the development of such capabilities could offer a less violent form of intervention in terrorist/hostage (to name one of the its most appropriate applications) scenarios. Of course I am by no means undermining its potential to be inherently harmful if the technology's capabilities are abused or fall into the wrong hands. An encryption device, offered by the American government to monitor what might problematically be called potentially dangerous electronic communication between Net users may provide a means to intervene on such situations. However ,the question to whether the governments hands are the right hands to hold such power has been greatly contested by Net users themselves.

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[12] According to a paper released by the American Convention Against Offensive Weapons, it would also appear possible to create high fidelity speech in the human body, raising the possibility of covert suggestion and psychological direction. "When a high power microwave pulse strikes the human body, a very small temperature change occurs. This is associated with a sudden expansion of the slightly heated tissue. This expansion is fast enough to produce an acoustic wave. If a pulse stream is used it should be possible to create an internal acoustic field which is audible. Thus, it may be possible to talk' to selected adversaries in a fashion that would be most disturbing to them." (USAF Scientific Advisory Board).

[13] I am referring to the destruction of individuals conceived as neuronal groups by the artist.

CHAPTER FOUR

Immunological Problems - Vindicating the Autonomy of a Self-Evolving System

One of the most urgent problems that persistently influences the politics of the internet is how to find a strategy to protect the autonomy of the system against what Tiziana Terranova calls "supra-imposed government intervention" (Terranova, 1996, page 176). The problem became more critical in 1994, the year when the Clinton Administration publicised its campaign to implement a new national infrastructure - the Information Superhighway. The initiative aroused great suspicion within American virtual communities and indeed suspicions were proven right when Clinton endeavoured to insert the infamous "Clipper Chip" clause into the deal. The clause was an encryption device ,one which afforded the user the power to decide his/her messages but would provide the government and law enforcement agencies with access to voice and date transmissions, coded or not. The Clinton Administration advocated the use of the encryption device in the interest of public safety but the virtual community was not convinced.

Firstly it was discovered that agencies, other than law enforcing ones would also have the power to tap into transmissions, although the government refused to name those agencies. Secondly it was argued that the actuation of the Clipper Chip clause would break the first, fourth and fifth Amendments, infringing on the right to freedom of association, disregarding the prohibition of secret searches and forcing users to reveal self-incriminating evidence. Moreover, the fact that the government stressed that Net users had the option not to have the chip inserted into their computers seemed to defy the purpose of their pubic safety policy. Ray Kramer, Acting Director of the National Institute of Standards and Technology recently said, "It's obvious that anyone who uses Clipper for the conduct of organised crime

is dumb" to which John Perry Barlow replied, "No Kidding. At least as long as it's voluntary" (Barlow, 1996, page 8).

The latter has suggested that as a law enforcement tool, wiretap is far less efficient than witness, informant and physical evidence. Over the past ten years only eight hundred wiretaps have been legally used as incriminating evidence. Considering that even the Department of Energy has been discovered to be listed as a lawful authority that will be able to access information, and considering that it will be the governments policy to make the chip involuntary as soon as it is publically accepted, the Net users right to privacy will be seriously underminded.

The Virtual community have reacted to this threat with the mobilisation of strategies to ensure protection against such imperialist projects of colonisation.[14] In her essay *Digital Darwin: Nature, Evolution and Control in the Rhetoric of Electronic Communication,* Tiziana Terrranova describes how Virtual communities countered the interventionist threat with a "neo-biological discourse". Censorship is viewed as the immunological problem of a self-evolving organism and the way to protect against government imposition is to have the organisms nodes to areas that ensure inviability (i.e. to a nation state where censorship regulations are less tight).

During the Teale Homolka trial of 1994 for example, a case of multiple murders, the government's attempts to enforce an information blackout was unsuccessful because of Usenet postings in the United States of America being available in Canada. Government's plans to impose order on the Net have been thwarted because of its dispersive behaviour,

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[14] Their strategies may also point to a way of protecting Stelarc's nervous system against the harmful use of technologies such as the stimaceiver.

Thank God that the Net is not a single entity, solid, it is not an object or a controllable resource . . .

There are some things that have taken on a life of their own and the Internet is one of them. A government may try to regulate or compromise it, but that will ultimately fail (Usenet posters, Oct. 94).

The interacting bodies that constitute the nodes and nexus of Stelarc's collective being might seem to have the same ability to evade an imposed control. Speaking of issues of responsibility for texts posted on the Net Mark Poster asks:

Who for example owns the rights to and is thereby responsible for the text on bulletin boards, the author, the system operator, the community of participants? (Poster, 1990, page 29).

Poster's question certainly complicates the notion of accountability where the latter avoids a strong link to any one individual. The theorist might well ask similar questions about the interactions that took place between Stelarc's host body and those individuals in Paris, Helsinki and Amsterdam who extruded their agency through it. When the artist's left hand side is prompted by another body thousands of miles away, who is accountable for the action - the prompting body or the artist (who still has full control over the right hand side of his body)? This duality would be further complicated if these interactions were happening simultaneously between thousands of bodies right across the Net. In this situation it is impossible to locate the origin or truth of an action in relation to a reality that is external to it.

In terms of a a technology such as the stimoceiver, its political activation could be thwarted if the origins of a deviant behaviour is lost amongst the multiplicity of exchanges that are dispersed across the system. In his essay *Two Lessons fro*

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Burroughs, Steven Shaviro offers a similar model of resistance through what the calls an "insect politics"(Shaviro, 1996 page 51). Speaking of locusts, he sees a method of defence in their swarming activities, in their ability to be in a state of constant flux, in that they are altered by the very processes that bring them together. There is no infrastructure that supports swarming insects, they can neither be identifyed as separate units nor conjoined into a higher unity. Shaviro claims

> If postmodern power is exemplified by the informational feedback mechanism . . . then maybe a postmodern practice of freedom can be discovered in the uncanny experience of insect swarms (Shaviro 1996, page 52).

The metaphorical power that Shaviro sees in insect swarms is that they are neither governed from the inside nor governable from the outside. This is the power that Sadie Plant sees in neural nets and systems based on neural nets that allow selectional processes to operate blindly without the imposition of pre-determined algorithims. Of course, on the other hand an inability to pinpoint the origins of a particular behaviour could provoke destruction on a massive scale. Just as mans attempts to wipe out insect swarms may never truly extinguish the species, the destruction of particular groups of insects finds the justification in an attempt to control their behaviour. The inherent power of the network is that its constituent units are dispersed, multiple and thus ungovernable. But the most worrying aspect of this power lies in the expendability of those units. Sterlarc's nervous system may indeed prove to be autonomous but this autonomy is achieved at the expense of those whose activities contribute to its power. Who finally benefits from a realisation of the artists strategy? Stelarc calls his nervous

system a "recursive being" and perhaps the man behind that recursive being will eventually become it.

CONCLUSION

Whose Brain is it Anyway?

Investigating the various avenues that Stelarc employs to extrude human agency, I have highlighted processes that expose the individual's autonomy and sense of reality to outside intervention. The notion of a "robot surrogate" points to a definition of vitality that explains it as a pattern, rather than a materially embodied presence. The conception of these robots as our "android other" forecasts a situation where the subjects most fundamental form of resistance is given up in exchange for a technology that promises a vast extension of the realm of human experience.

The extent to which robot surrogates are deemed to be capable of exhibiting intelligent, autonomous behaviour is problematic. The debate surrounding definitions of intelligence, consciousness and creativity threatens to overlook the fact that an android's behaviour is always programmed, shaped by an individual who by profession plans and controls the operation of such systems. Stelarc claims that these androids will function as an extended parameter of the self. When an individual's perception of reality is mediated, or indeed manipulated in such a manner, his very sense of himself is at stake, he can no longer trust his nervous system because it isn't *his* nervous system anymore.

The exchange of agency between real bodies as constituent parts of a dispersed network forms the structure of what the artist calls an external nervous system. The future potential or plight of those individuals involved is considered through my exploration of various models of the biological nervous system. These models predict that persons acting analogous to neuronal groups in the brain will create an emergent system, bereft of any centralised control. However, the autonomy of the system will be vindicated at the expense of the individual's autonomy, the latter's

sense of self diluted in the complexities of exchange. With survival depending on the frequency of this exchange, the individual must continuously host the intentions of others to succeed.

It is a reality that technology itself positions people differently in society. Considering that technology will be intrinsic to the external nervous system's make-up, it is unrealistic to think that an empowering mechanism such as the stimoceiver would not be readily sought after by individuals who are exposed, vulnerable, bereft of the surity of the self. It is probable that such technologies will fall into the hands of the technologically advanced, thus reinstating the vicious circle that is occuring in reality right now. While the dispersed nature of the system evades supra-imposed control, it provides the more modest dictator with an infinite number of avenues through which individuals can be manipulated.

The realisation of Stelarc's concept would result in a powerful phenomenon, but the power lies with the system itself, not with its constituent units. The processes of the biological nervous system creates consciousness, the artist then as creator of a nervous system could assume the role of Immaculate Fatherhood.[15] Unsatisfied with the limitations of his current bounded, biological nervous system Stelarc seeks to create a new one. In what may seem like a radical departure from the areas covered by this thesis, I would like to quickly mention Norman Mailers observations on psychopathic behaviour and the nervous system. In his book *Advertisements for Myself,* Mailer explains,

> Generally we are obliged to act with a nervous system which has been
> formed from infancy, and which carries in the style of its circuits the very

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[15] A term borrowed from Terranova's *Digital Darwin: Nature Evolution and Control in the Rhetoric of Electronic Communication.*

contradictions of our parents and our early milieu. Therefore, we are obliged, most of us, to meet the tempo of the present with reflexes and rhythms which come from the past (Mailer, 1961, page 298).

Those individuals that constitute the rest of us, Mailer characterises as psychopaths and part-psychopaths adding, the marked trait of a psychopath is that he is trying to create a new nervous system for himself. Citing the late Robert Linder he claims,

> . . . the psychopath is a rebel without a cause, an agitator without a slogan, a revolutionary without a programme: in other words his rebelliousness is aimed to achieve goals satisfactory to himself alone; he is incapable of exertions for the sake of others (Mailer 1961, page 297).

My intention is not to uncover the psychopath within Stelarc, it is however, to foreground the artists investment in a strategy that seems to offer humankind nothing but a spurious rhetoric of emancipation in an already complex discourse of control. Stelarc has spoken of a new human order in technological society, one which he claims could be captured on behalf of the preservation of humanity. But surely humanity values the human, the individual who is an expendable unit in the power of Stelarc's nervous system.

If the artist's stimboid software results in a new consciousness, a new being, Stelarc is both omnipotent creator and "Immaculate Father" of such a phenomenon. In *Digital Darwin*, Terranova argues that behind the discourse of cooperation and decentralisation "artificial life and cyberevolutionism cannot hide the fact that systems are somehow always made" (Terranova, 1996, page 77). She claims that issues of power are disguised when the notion of design is erased. Terranova associates attempts to create artificial life with an endeavour to exploit natures

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capacity to create complexity for the purposes directed by the "researcher/breeder/idle God" (ibid page 77). The director of the experiment does not relinquish power, rather he is looking for a flexible way to exploit and direct to his purposes the very unpredictability of complex systems. As I have mentioned before Hugh Loebner who awards yearly prizes to artificial intelligence researchers has arrogantly claimed,

> If we're capable of creating a computer that is sentient, then from the point of view of that computer, humans will be gods (cited in Wired 1995, page 80).

A project similar to Stelarc's is currently being undertaken by a Japanese research team. Known as the Darwin Machine, the project aims to build artificial brains from the Internet. The engineers use unfounded evolutionary and anatomical discourse to validate their claim that as nervous systems developed prior to the brain the Internet can be developed into an artificial brain. No doubt this brain will, like practicing Judeo-Christians, forever look to its creator for guidance and so be insidiously controlled by his legacy. Stelarc's strategy for human evolution seems to incorporate an agenda of domination that is very innovative about its form. The artist would disagree

> "There are conspiracies in the world, but to see a conspiracy behind every cooperation every new technological invention I think is to have a very pessimistic view of the world," and provides a solution for my wariness. "If we have to have a pessimistic view of the world then we certainly have to examine the evolutionary design of the human body"
> (Stelarc, http: // www.to.or.at/stelarc/interview.01.htm).

But then again, he would say that.

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