

MACHINA CARNIS

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Abstract

The “*machina carnis*” project investigates issues relating to first-person biomedical research, the recontextualizing of scientific digital image data and the re-privileging of the aesthetic experience of corporeality. The risks and ethics, potentials and pragmatics, of a visual artist engaging with contemporary experimental biomedical research - both practically and theoretically - are outlined and discussed.

Within the matrices of an innovative, collaborative art/science research model a hybrid amalgamation of research practice and research subject occurs; featuring the artist as “human guinea pig”. The functional and speculative framework of the project is interrogated via its artistic outcome: the “*machina carnis*” installation.

Keywords

Scientific representations, stem cell, art/science, time-lapse videomicrography, human guinea pig, living systems, first-person scientific experimentation, biomedical engineering, recontextualization.

Project

This project responds to the personal and emotional aspects of my scientific experiences. From this subjective perspective I framed the following questions for consideration throughout:

- On what level are my cells sentient beings?
- What is their status *in vitro* outside my body?
- How will I feel during my experiments when I observe my cells living in culture?
- How will installation participants respond to the human cellular digital image data in the art-installation context?

These queries informed both my engagement in the practical scientific processes and the artistic outcome: the “*machina carnis*” installation.

Biomedical Context

Although there are historical precedents in the sciences for self-experimentation I encountered bureaucratic resistance as soon as I proposed using human tissue as a medium for my art; regardless of the fact that it would come from my own body. This first-person methodology was fundamental to my lines of enquiry and I was not prepared to give it up – although, ultimately, the pursuit of ethical clearance took over a year. Of the many protocols regarding the use of human tissue for laboratory experimentation, from a hygiene perspective, there is a danger of transmitting life-threatening diseases when unscreened human material is put into equipment and cultured in the laboratory.

The complexities inherent in ownership and informed consent that surrounds the current worldwide use of HeLa cells in laboratories also highlights the intricacies of the ethical and moral issues involving experimental research on human biological material. Briefly, in this 1951 landmark case, cells were cultured without permission from the biopsy of a low-income, black American woman, Helena Lacks [1]. During the elapsing decades these cells have become so common in standard laboratory experiments that it is suggested that some biologists no longer classify them as human; merely regarding them as single-celled micro-organisms [2]. This is a significant reflection upon the fragile and permeable constructs of “humanness” from which it is only a small step towards notions of the posthuman. These

speculations, extensively interrogated by postmodern literary critic: N. Katherine Hayles, instantiate the material body to such an extent that it is seen as informational patterns in which biological embodiment becomes accidental rather than inevitable [3].

Laboratory Experiments

The innovative laboratory “*machina carnis*” project model takes the form of investigative research at the interstices of both art and biomedical science. The data collection and laboratory experiments were supervised by my scientific collaborator, Dr. Victor Nurcombe at the School of Biomedical Sciences, The University of Queensland. The university ethical clearance process for experimentation on human cells proved to be very complex and lengthy. We finally expedited this procedure by altering our plans to take advantage of existing university protocols. To do this we changed from the proposed use of adult stem cells from my tissue to those extracted from my blood.

My experiments began by extracting adult stem cells from my blood sample which were then cultured and changed into cardiac cells in the laboratory. Adult stem cells are now regarded as “pluripotent” or capable of becoming different types of cells when modified by recently developed scientific procedures. These processes manipulate and redirect the development of adult stem cells so that they are in effect “changing fates”. After three days in culture the drug 5'AZT was added to induce the adult stem cells to become distinctive, muscle-forming cells. At the same time a mixture of cardiac

differentiating factors, with a proprietary molecule, were also added in order to change the undifferentiated stem cells into cardiac cells. In response to this unique chemical mix the cells reproduced, matured and began to develop characteristics of heart cells. Each cell has a signature combination of proteins with a fraction of DNA.

The innate characteristics of heart cells lead them to seek each other out, to cluster and beat and then to synchronise their beating. At this stage, after seven days in culture, they can be observed as a large pulsating mass. As Dr Nurcombe explains it, every cardiac cell has recognition modules on its surface membranes that 'interdigitate' or link 'gap junctions' like 'open portholes': '(E)ach heart cell first has to mature, then it makes the machinery to start beating, then

the beating cells come together to "link hands" in ribbons...the heart is a "net" of these beating cells' [4].

Finally the clusters of beating heart cells were recorded by time-lapse digital videomicroscopy, providing documentary image data that I would later recontextualize in the "*machina carnis*" installation.

Personal Responses

Holding containers of my own cells in the laboratory had a profound and intense effect on me. This unusual emotional and physical proximity generated an ambiguous relationship between me - in my role of experimenter - and the cellular material. Under the microscope, from an essentialist perspective, I observed my stem cells respond to the shock and disturbance of being removed from my body by

withdrawing and shrinking into circular shapes in the culture medium. After only a short time in the incubator I was amazed to see that they had acclimatized to the environment in the culture dish and were spreading out. I had not anticipated this level of apparent sentience in such small organisms.

In order to gain some understanding of these unexpectedly cognisant cellular responses I attempted to identify the different degrees at which living organisms can function. Author and physicist Evelyn Fox Keller, who worked for many years at the interface of physics and biology, points to the necessity to characterise those special properties or features that distinguish a living system from a collection of inanimate matter [5].

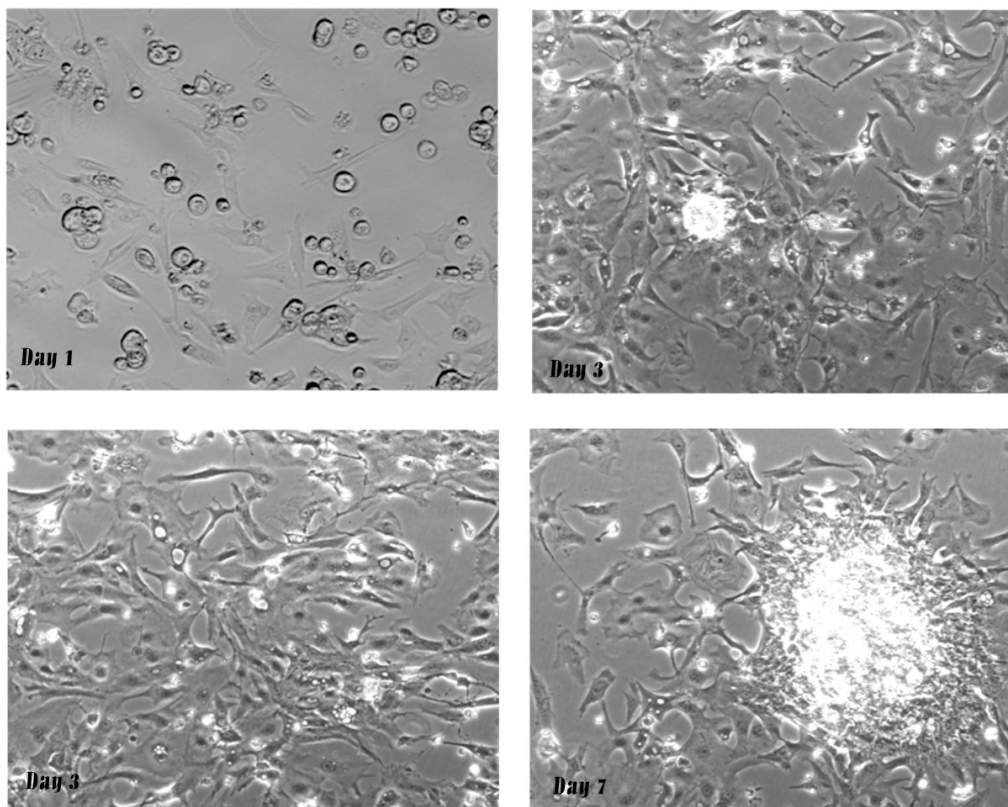


Fig. 1. Digital videomicrograph stills of stem cells from the artist's blood being changed into cardiac cells in culture. Day 1 stem cells in culture are disturbed and curled up. Day 3 stem cells have recovered and have chemical growth mix added. Day 5 cardiac cells begin to form. Day 7 the cardiac cells form a large beating cluster in culture. (© Trish Adams).

My subsequent investigations also revealed that biologists Humberto Maturana and Francisco Varela have formulated a model of life systems in which cognition is understood as a biological process.

In their groundbreaking theory they introduced the term “*autopoiesis*” to classify the fundamental dialogue between structure (brain) and function (process). Systems theorist Frijof Capra points to the importance of the concept of “*autopoiesis*” as a central insight within Maturana and Varela’s Santiago theory of cognition [6]. Here, they refer to circular, self-sustaining “*autopoietic*” processes of “self-organisation” which connect the process of knowing with the process of life in even the simplest of cells:

‘(T)he brain is not necessary for mind to exist. A bacterium, or a plant, has no brain but has a mind. The simplest organisms are capable of perception and thus of cognition. They do not see, but nevertheless perceive changes in their environment – differences between light and shadow, hot and cold, higher and lower concentrations of some chemical etc’ [7].

Therefore, as a result of my investigations into contemporary theories of consciousness and sentience and the status of my cells as living entities, it appeared to me that at all levels of life mind and matter, process and structure, seem to have an inseparable connection.

Artistic Reinterpretations

How an artist might re-interpret and recontextualize scientific research data in ways that would retain its impact, whilst moving away from the documentary context, has been of primary concern during the “*machina carnis*” project. For me it involves speculation on how to creatively effect disruptions to the habitual proscription inherent in the perception of representations.

Significantly, according to academic and artist: Anna Munster, ‘digitality provides a set of lived circumstances in which our senses encroach upon us in a different way’ [8]. The “*machina carnis*” installation incorporates this premise in its concentration on the perceptual impact of the human cellular digital image data. This is recontextualized for inclusion in artworks as a site for identification and empathy between the digital image research data and the viewer.

During my art/science practice I have had the opportunity to associate with the advanced digital imaging and technologies incorporated into scientific research and documentary processes; including the JSM Scanning Electron microscope.

At this level the position of the observer involves extensive prosthetic dependency and arguably a leap of faith. It necessitates trusting in the veracity of the machine with all its potential epistemic and technological limitations.

Reliance on machinic interpretations prompts speculation about the status of scientific imaging. In this context the relationship between machine and observer are particularly problematic if, in the words of Hayles, ‘the observer... does not so much discern pre-existing systems as create them through the very act of observation’ [9].

Of particular consideration here is the implication that, in the otherwise invisible layers of the microscopic, the technologies of seeing become mechanisms for believing.

Scanning, tunnelling microscopes are in fact referred to as “endo technology” and the science of Endophysics addresses such issues as observer-relativity, representation, and non-locality; exploring what a system looks like when the observer becomes part of the system.

“*machina carnis*”

Artwork

The artwork “*machina carnis*” theoretically and visually articulates the processual, pioneering, immersive model in which I undertake the dual roles of first-person researcher and “human guinea-pig”. The installation configuration fosters an interrogation of the nature of the “self” in relation to expressions of corporeality and probes the role of media art installations in crossing the consciousness divide.

In relation to this, new media theorist and artist Simon Biggs suggests that perhaps the most important questions regarding artists’ use of digital media are those of ontology. He asks ‘(H)ow this medium impacts upon and problematizes the old certainties of how the self (singular and collective) is understood to come into being?’ [10].

My decision to position myself, my personal scientific digital image data, and subsequently the individual participants, literally at the core of the installation fosters a connection beyond the “self”, and also an interrogation of the emergence of the “self”. When adopting this model I was also building upon my interrogations of endophysical systems that explore immersive constructs and observer relativity.

Consequently, the “*machina carnis*” installation structure reflects a sensual reading of the scientific experience. It operates on the premise that the human cellular digital image data symbolizes more than an impersonal scientific outcome of the laboratory experiments.

Accordingly, the installation is structured to draw each participant into an individual relationship with the project’s underlying complexities. This is brought about by creating an intense engagement with the experimental digital image data and its accompanying sound environment. Throughout this

paper the fundamental conceptual importance of my own immersion in the scientific procedures has been emphasised.

By carrying out the scientific processes myself and using my own cells for experimentation I have been able to complicate the discourses of vision that historian Martin Jay refers to as the ‘Cartesian dualism’ of the ‘disembodied eye’ [11]. I regard the time-lapse digital videomicrograph image data as being imbued with intimate traces of its human origin.

My subjective responses during the scientific laboratory experiments led me to create an interactive artwork where participants are immersed emotionally in issues relating to “humanness” and living systems.

The installation structure parodies my own scientific and physical immersion during the project. This emphasis on the human source of the project’s scientific digital image data also serves the purpose of encouraging viewer empathy with the installation outcomes.

Viewer as Participant

The impact of the theory of so called “self-making” on the structure of the “*machina carnis*” installation is apparent in the open-ended methodologies. These encapsulate manipulable systems where the boundaries between the body and its environment are in a constant state of interplay and flux. The interactive digital technologies are selected to promote and facilitate this flexible approach.

When an installation participant observes the digital image data of the human cultured cardiac cells beating in synchrony with their heartbeats it is as if a microscopic simulacrum of their own beating human heart - the vital, functioning, interior engine of their body - were laid bare before them, so deeply are they implicated in the installation systems.

This cardiac cellular digital image data is visible on the monitor above the participant. In addition a webcam, appropriately situated, overlays

an indistinct digital image of the participant’s face in the cellular image frame visible on the monitor. This is intended to increase the sense of immersion experienced by the participant.

The interactive digital technologies have been integrated discretely into the “*machina carnis*” installation. This facilitates user-friendly access to the artwork so that there is no complex digital interface to distract participants from the phenomenological impact of the human cellular digital image data or emotive responses evoked by the sound of their heart beats. It is proposed that this structural relationship embodies the viewer as a network participant and fosters receptivity to the multi-sensory impact of the artwork environment [12].

Overview

The “*machina carnis*” project has created spaces for a visual artist to engage with “cutting edge” biomedical science and to creatively reinterpret the resultant digital image data and

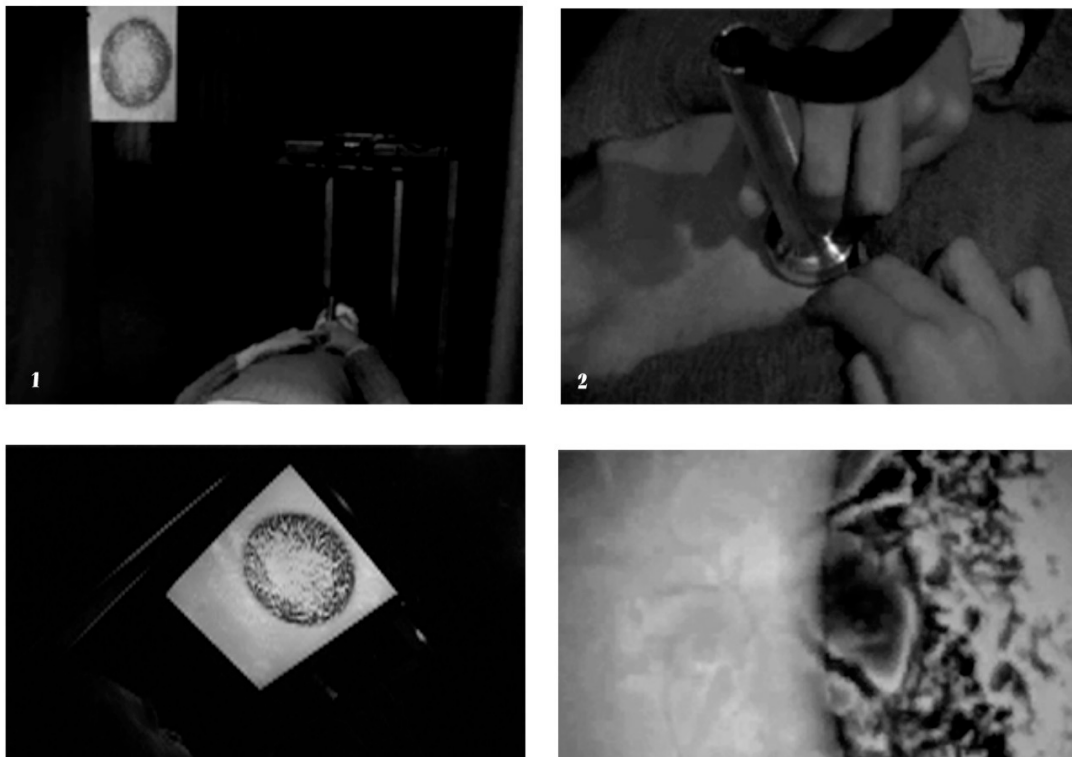


Fig. 2. A participant lies on the couch in the *machina carnis* installation. 2. She locates her heart with the modified stethoscope. 3 She looks up at the digital video microscope image of the cardiac cells. 4 She sees her facial image in the image frame. (© Trish Adams).

research outcomes in the public domain. The project is grounded in the interconnectedness between biomedical research and twenty first century perceptions of the “self”-both emotional and biological.

The open-ended, innovative methodologies enable the multi-perspective artist/researcher to transcend the borders between a theoretical model and its application to contemporary research. It accommodates individual experiences through a hybrid art/science matrix. The “*machina carnis*” interactive installation recontextualizes the scientific digital image data. Furthermore, individual viewers are implicated as participants who complete the installation; according to their personal responses to the socio-cultural and biomedical issues that it incorporates.

Author Bio

Trish completed her Doctor of Visual Arts at Griffith University in 2005. Her thesis explored the impact of experimental biomedical engineering techniques on expressions and representations of corporeality. Her interactive installation: “*machina carnis*” incorporated digital video micrograph image data of cardiac cells that she created in the laboratory by converting adult stem cells from her blood. Trish is currently artist-in-residence with the Visual & Sensory Neuroscience Group, at the Queensland Brain institute, The

University of Queensland. Under the leadership of Professor Mandyam Srinivasan this research group focuses on the cognitive and navigational abilities of the honey bee. Trish’s first artwork outcome from the residency was the DVD installation: “HOST”. Most recently, Trish and her Sydney based collaborator Andrew Burrell have been awarded an Australia Council for the Arts Inter-Arts Board MMMUVE_IT initiative. They plan to incorporate their direct observations of bee behaviours into both a virtual Second Life environment and real-time installation contexts as the project develops. In addition, Trish has presented her research outcomes at a number of conferences such as: “*New Constellations: Art, Science & Society*”, Museum of Contemporary Art, Sydney, 2006; Perth Digital Art & Culture Conference, 2007 & ISEA2008.

Acknowledgements

Dr. Victor Nurcombe: my scientific collaborator.

School of Biomedical Sciences, The University of Queensland, Brisbane, Australia: extensive in-kind support /laboratory facilities (2003- 4).

Australian Postgraduate Award through Griffith University, Brisbane, Australia (2002-5).

Brisbane Powerhouse: venue and in-kind support for the ‘*machina carnis*’ installation.

Ben Wickes: “*machina carnis*” documentary video.

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