

## *Bodies in Biotechnology: Embodied Models for Understanding Biotechnology in Contemporary Art*

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*Figure 1: Workhorse Zoo*  
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### **Keywords**

biotechnology, BioArt, science criticism, embodiment, bioinformatics, contemporary art

### **Abstract**

This paper serves as an introduction to an evolving series of texts exploring the intersection between computation, biology, art, science, and education.

Contemporary biotechnologies are often portrayed as if all forms of biological manipulation are genetic and equivalent in protocol to data entry command key-strokes <insert>, <delete>, <copy> and <paste>. This blanket application of computational models to instances of biotechnology provides a sterilizing affect, removing all that is wet, bloody, unruly, and animal, from mass imaginations of the biotech future. “Bodies in Biotechnology” focuses on moving away from computational models and reuniting notions of embodiment with the language and representation of biotechnology with a social and political mandate towards informed discourse and public consent. Methodologically, the author proposes artistic means for non-specialists to engage in biotechnology as an embodied practice. Thus, the essay argues for a more holistic understanding of evolving biotechnologies through practical means, an approach that results in a complex text that neither supports nor denounces the advancement of biotechnology.

## ***Introduction***

Insert block of new genes into a freshly fertilized egg. The one cell becomes two, then four, then eight. Each new version carries the extra information. In nine months, a baby is born. Every cell in his or her body contains the extra genes [1].

In his article “Designing Baby: Scientists on Verge of Manipulating Human DNA” Daniel Q. Haney describes a biotechnological process called human germline engineering. He explains to his readers the way in which scientists are working to genetically alter human embryos immediately after conception so that genetic changes will be passed on to the embryo’s future offspring. Haney’s article is exuberant in its description of the therapeutic potentialities of this technology but brief in describing the actual processes that are involved in germline engineering. He relies heavily on digital metaphors to describe wet biotechnological practices involving living organisms to the general public.

Contemporary media representations of biotechnology often place great emphasis on notions of digitality and programmability as inherent technologies of the human organism. As if our ‘cumulative’ technology, computation performs the ultimate science, the dominion of human intelligence over nature through the application of numeric code to living organism. Contemporary biotechnologies are often portrayed as if all forms of biological manipulation are genetic and equivalent to data entry command keystrokes <insert>, <delete>, <copy> and <paste>. The subtext inherent in this kind of language is that the practice of biotechnology is digital one — that programming a body is equivalent to programming a computer. Digital models for understanding biotechnology come from a variety of mainstream media sources — print, Internet news wires, film and television series.

For example, in Stephen Spielberg’s *Jurassic Park* (1993) a well-meaning scientist clones prehistoric dinosaurs utilizing DNA extracted from blood stored within fossilized mosquitoes. The cloning process is described to audiences through a theme park mascot character: Mr DNA. He explains, “Thinking machines, super computers, and gene sequencers break down the strand in a minute and virtual reality displays show our geneticists the gaps in the DNA sequence” [2]. He prattles on, speaking the virtues of cloning and the connection between genetic and digital codes. Certainly, *Jurassic Park* is a children’s movie, but it is indicative of a flood of representations within the last two decades that reinforce public conceptions of biotechnology. The blanket application of computational models to biotechnology can provide a sterilizing affect, removing all that is wet, bloody, unruly, and animal from mass imaginations of the biotech future, arguably skewing public interpretation complex bioethics involved.

In *The Language of New Media*, Lev Manovich argues that often in the interpretation of a new communication innovation, we apply our experience, knowledge, and language of pre-existing innovations in describing new technologies. I would argue that this model — rooted in communication studies — is a viable strategy for interpreting the language surrounding innovation in other fields as well. When we look to contemporary language and representation surrounding biotechnology, a great emphasis is placed on the digital as a predecessor to the instrumentalization of biological tools and, therefore, as a viable means of understanding and describing biotechnology [3]. Here the ‘biotech era’ becomes inherently understood as a byproduct of the ‘information age’ (with heavy reliance on a progressive model for technological innovation). Katherine Hayles makes a similar argument in *How We Became Posthuman*, linking the presuppositions of cybernetics with some of those found at the very foundation of evolutionary biology:

The models proposed by evolutionary biologists have encoded within them cultural attitudes and assumptions formed by the same history they propose to analyze . . . . To take only one example, the

computer model advanced by Jerome H. Barkow, Leda Cosmides, and John Tooby in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* to explain human evolutionary psychology testifies at least as much to the importance of information technologies in shaping contemporary world views as it does to human brain function [4].

However, our reliance on digital models in describing biotechnology is more complicated than the progressive application of technological language in describing the new. Biotechnology, though a very old field engaged in the instrumentalization of biological tools, has experienced a contemporary renaissance with the intersection of computation and the biological sciences. Eugene Thacker describes this incarnation of biotechnology in his essay “Data Made Flesh: Biotechnology and the Discourse of the Posthuman”:

Biotech research is unique in that, on the one hand, it employs the technologies common to other posthuman fields (principally, computer/information technologies), but on the other, its constant “object” of study is the domain of the biological (a domain traditionally set apart from the technological). Instead of being focused on disembodiment and virtuality, biotech research's approach to informatics is towards the capacities of information to materialize bodies (bodies amenable to current paradigms of medicine and health care) [5].

Though Thacker's definition of biotech is useful in that it incorporates the body into the bioinformatic fold, he still places singular significance on the role of computation in biotechnology, effectively erasing hundreds of years of biotechnology before the advent of the computer and mobilizing the subfield of bioinformatics as the defining feature of biotechnology.

“Bodies in Biotechnology” serves as a gesture towards re-embodiment of the tools and media of biotechnology in the public sphere through artistic means. My intention is not to support or denounce the advancement of biotech in general but instead to highlight the instrumentalization of living systems that is often overlooked with the application of digital metaphors in this field. This research relies heavily on the works of Thomas Kuhn, Steve Woolgar and Bruno Latour, and Evelyn Fox Keller, amongst others, for significant and foundational critical engagement in the sciences. However, I am proposing a shift in methodology (from the theoretical to the practical) — instead of identifying the specialist, analyzing and theorizing the circumstances of biotechnology — I am proposing a model for critical engagement where artists, and business leaders, and mothers, and students, are invited to participate and be implicated in biotechnological processes.

We need to redefine biotechnology as a technology of living systems — as a technology of bodies. For this definition to operate successfully, we need to expand our definition of the body — the human body, the animal body, a body of water, bodies within the body, antibodies. I propose we look to Elizabeth Grosz's model for refiguring the body as proposed in *Volatile Bodies: Towards a Corporeal Feminism*. Grosz argues that the mind/body dualism prevalent throughout philosophy must be refigured for feminist purposes. She proposes we mobilize the body through a range of disparate discourses not restricted to naturalist and scientific models. She states, “A plural, multiple field of possible body ‘types’, no one which functions as the delegate or representative of the others, must be created, a ‘field’ of body types — young and old, black and white, male and female, animal and human, inanimate and animate — which, in being recognized in their specificity, cannot take on the coercive role of singular norm or ideals for all the others” [6]. This model is convincing in Grosz's feminist argument for reinscribing the body but also aptly suits my purposes in arguing for embodied readings of the biological components in biotechnology. With a shift in the definition of the body towards a non-anthropocentric plural and multiple field of bodies, we can begin to imagine and insert animal bodies, chimera bodies, bacterial bodies into models for embodied biotechnology [7].

In order to perpetuate a more inclusive, embodied model for biotechnology, we need to develop more open, complex, participatory, and less sensationalized and digitized visions of biotechnology. At this juncture almost no popular media sources are participating in this representational shift, but there is great momentum growing in alternative venues, with artists, theorists and media activists, all working to desaturate established authoritative visions of biotechnology. One example is an evolving field of artistic production called BioArt. BioArt is many things, and its definition is debated avidly in art/science circles. I see BioArt as the mobilization of biological systems in art practice. It can include something as fundamental as the use of animals, plants, bacteria or the human body in the production of artwork — including live and deceased specimens. BioArt can also include the biological sciences and biotechnologies in art production — including genetic engineering, tissue culture, and bioinformatics. Some definitions of BioArt extend through bioinformatics to works that deploy ALife and artificial intelligence technologies. I wish to restrict my definition of BioArt to those works where the biological is mobilized rather than represented as practice based embodied methodologies are essential to this investigation. Though BioArt is a wide-ranging field, for the purposes of this paper I wish to introduce three works that contribute directly to my arguments for expanded notions of embodiment in biotechnology.

In 2002 Artists Adam Zaretsky and Julia Reodica exhibited a complex work of BioArt entitled *Workhorse Zoo* (see figure 1, page 1). *Workhorse Zoo* is a durational work that consists of an 8” X 8” laboratory grade Simplex Isolation System Clean Room, where the artists cohabitated for a week with an assortment of organisms used in laboratory experimentation. Their Noah’s Arc of participants included bacteria, yeast, plants, worms, flies, fish, frogs, mice, and humans. Each specimen was selected for exhibition based on their ‘workhorse’ role in laboratories. Zaretsky and Reodica were interested in introducing the general public to the silent biotech participants — and create a site where laboratory grade plants and animals were able to cohabitate and interact, engaging in various life cycles such as reproduction, consumption — and cannibalism. The clean room was installed in a public window at the Salina Art Centre in Kansas. The artists performed a variety of personae with different relations to the environment and coexisting organisms. With costumes, and vignettes, and three days worth of industrial prepared foods, Zaretsky lived — while Reodica visited — a biotechnological tableau, undermining the objective relationship between researcher and specimen we rely on in our understanding of laboratory research. The public was invited to “feed the animals” and partake in an opinion questionnaire surrounding the use of animals in art and scientific research — but mainly they gawked, and talked, and, in some instances, partook in hungry artist meals of fried mouse, frog, and greens. Zaretsky and Reodica describe their intentions in *Workhorse Zoo* in their artist statement:

We feel as if the display of these animals in a spectator arena is an aid towards intelligent discussion about animal research, pro or con, without the moral superiority of pat answers. These are the organisms that shoulder the brunt of scientific invasiveness. These are the organisms whose genomes have been sequenced and partially annotated. These are the evolutionary templates with whom we search for homologies to assess our own inherited pains. Much of the public has little or no idea how much the deadly study of these select strains effects their health and potential physical future [8].

This work — contained and simultaneously unruly — mobilizes all that is wet and carnal in biotechnology to upset preconceived notions of biotech research as inherently digital, high-tech, objective, and orderly. It invites artists and audience members to meet and interact with biotech bodies — to understand their sometimes, sentience, pedigree, and origins. These concerns are addressed most poignantly in the behind-the-scenes organization that makes such an installation possible. Most specimens were delivered via courier from a number of companies specializing in producing laboratory grade organisms for research. Charles River Laboratories (at 1-800-LAB-RATS) was contracted to deliver two mice — one lactating mother with newborns and another guaranteed to give birth upon arrival or shortly after. The industrialized reality of the status of living specimens

in the laboratory is clear. Upon completion of the installation, all remaining animals were released in a local farmers field — *freedom* — a dangerous and unlikely fate for these cultivated specimens.

Another instance of significant exploration of embodiment in BioArt can be seen in a collaborative group called Tissue Culture & Art Project (TC&A, established in 1996 by Oron Catts and Ionat Zurr). TC&A is housed as the founder of the SymbioticA Laboratory at The School of Anatomy & Human Biology at The University of Western Australia. In 2000, TC&A artists Oron Catts, Ionat Zurr and Guy Ben-Ary developed a seminal work entitled *Tissue Culture and Art(ificial) Womb 2000*, also known as *The Process of Giving Birth to Semi-Living Worry Dolls*. More widely know as *The Semi-Living Worry Dolls* (see figure 2, below), the work is comprised of a complex mobile (and biologically self-contained) laboratory environment and a series of sculptures created utilizing tissue engineering technologies. Based on the tradition of Guatemalan worry dolls, TC&A sculpted doll forms with biodegradable polymers and surgical thread. The sculptures were sterilized and seeded with mouse fibroblast cells in the laboratory. They were, then, cultivated in incubators and nourished with antibiotics and media that allowed the cells to grow, proliferate, and attach themselves to the porous polymers. The completed works were exhibited in rotating bioreactors, creating a micro gravity environment to encourage three dimensional tissue formation. The artists are providing host bodies — representational bodies — for the cellular networks that, otherwise, are understood as sub-bodies in the popular mind-set. TC&A invites its viewers to log on to an affiliated website and place their worries in the hearts of the bioengineered dolls to stave off concerns and anxieties about ultimate truths, biotechnologies, and capitalist drives.



Figure 2: *The Semi-Living Worry Doll*  
Copyright © TC&A, 2000

Like a mobius strip, this work consumes itself, both participating in biotechnology and critiquing it — both dissuading public fears, and playing on them at the same time. *The Semi-Living Worry Dolls* provides no scripted outcomes. Catts and Zurr explain in an article published in *Leonardo* in 2002 that, “The realization that parts of the body (cells/tissues) can be sustained alive outside of the body and be made to grow into artificially designed shapes can lead either to a (false) sense of complete control over living materials (which seems to be the ideology governing the biotech industry) or to the understanding of the importance of communities and collaborative effort in the construction of complex systems (from the single cell to global society)” [9].

Ironically, it is the worry dolls that are at risk in the exhibition environment. Contamination is deadly to these fragile sculptures — and each installation ends in a ‘killing ritual’ where viewers are invited to touch the dolls with their bare hands — ending a life.

Oron Catts and Ionat Zurr have continued on with TC&A, producing a number of important works involving tissue culture protocols including *Pig Wings*, *Disembodied Cuisine*, *Victimless Leather*, and *Extra Ear 1/4 Scale* in collaboration with Stelarc. In addition, Oron Catts is Artistic Director of the SymbioticA The Art & Science Collaborative Research Laboratory where, working along with Dr. Stuart Bunt and Dr. Miranda Grounds, artists are invited to learn new techniques, facilitating the production of works that overlaps the boundaries

between art and science. Catts and Zurr see great significance in training others in biotechnological techniques, bringing more non-specialists into the fold. Their efforts to share this knowledge with others has culminated in the newly established SymbioticA Biotech Art Workshop co-operated by Oron Catts and Gary Cass. A work of art in itself, this event provides hands-on, personal experience for artists with techniques of DNA extraction, plant and animal tissue culture, bacteria plating, and genetic transformations. This event has been successfully hosted at The Experimental Art Foundation, The University of Western Australia, The University of Wollongong, and Kings Collage London.

Lastly, Kira O’Rielly is a celebrated performance and body artist from the United Kingdom who completed a residency in 2004 at SymbioticA where she developed a number of skills and knowledge with a variety of tissue culture protocols and research into animal ethics in the laboratories at The University of Western Australia. This exploration resulted in a number of works, most notably two: a performative lecture entitled *Marsyas — running out of skin*, presented at the Biennial Electronic Arts Perth (2004), and a performance, *inthewrongplaceness* (figure 3, right) (2005) hosted by HOME London, UK.



*Figure 3: inthewrongplaceness*  
Copyright © Kira O’Rielly, 2005

*Marsyas* is a provocative work of art and academic research. O’Rielly links performative actions (instructions for her body) with laboratory protocols for harvesting primary cell line sources (instructions for the animal body):

**Action 1**

Art gallery.

Two leeches are placed on my back.

They feed until sated.

They drop off.

Audience drink red wine.

Bite wounds bleed continuously down back [10].

Remove small sections of skin separating dermis and epidermis.

Go for dermis. Epidermis v. thin with keratinized cells.

In dermis will get fibroblasts, some stem, maybe some viable keratinocytes.

Place tissue in dish

Trim away unwanted tissue.

Leave in dish with P/S for 30 mins. [11].

Through cruel language, inner voices, and cold analytical turns, she elucidates for her audience the turmoil she experienced working with living systems in the name of art. A dangerous and brilliant move. O’Rielly is arguing for shades of grey in understanding and performing embodied art practices. In a time of heightened political censorship, with legal actions against artists like Steve Kurtz and *Critical Art Ensemble*, and the resulting fear that has pushed so many others to conformity, O’Rielly presents publicly both the power and importance, as well as the harm and humility in instrumentalizing living systems. While practicing the harvest

of primary cells, O'Reilly witnesses the institutional sacrifice of a pig for another experiment at the university. After the scientists have harvested theirs, she begins her exploration of the animal's body. As she says, "When my clumsy blade accidentally tears her gut I see pigs breakfast spill. In my minds eye I see my breakfast spill. Following the pig biopsy I feel deeply ashamed. You stupid, stupid cow" [12]. This work becomes about the disillusionment of the non-specialist — *about induction*. The artist is horrified with herself. The audience is horrified with the frank retelling of animal sacrifice procedures enacted in scientific laboratories every day. O'Reilly serves as a stand in — as our stunt double — in allowing us to witness those aspects of scientific research often closed to the public gaze.

*Inthewrongplaceness* reads differently. Performed months after her return to the United Kingdom, this work seems to be about hindsight — about making up with the pig, making love to, and lamenting the death of the pig. In a grand Victorian house in London, England, O'Rielly installed herself nude with a freshly slaughtered pig and a taxidermied swan, seven-legged lamb, and three-legged piglet. She caressed and held the pig, eventually thrusting her head into its chest cavity. With deep religious and sexual undertones, she performs for us in a most honest and shocking way the "bodyness" implicit in all parties involved.

The works presented here are of great significance in performing — presenting — and representing some of the bodies in biotechnology for non-specialized audiences. None of these works rely heavily on digital technologies and, yet, all are reflective of very real and contemporary incarnations of biotechnological research. Where Zaretsky and Reodica introduce their audience directly to the organisms instrumentalized in the laboratory, TC&A renders the techniques of in vitro tissue culture open to the public domain, and O'Reilly laments the real little tragedies that occur in laboratories each day. With these works, digital metaphors for biotechnological protocols are undermined through practice-based methodologies directly implicating the non-specialist in biotechnology as a technology of living systems – as a technology of the body.

### **References and Notes**

1. Daniel Q. Haney, "Designing Baby: Scientists on Verge of Manipulating Human DNA", Associated Press, March 5, 2000. Available online at [http://www.genetics-and-society.org/resources/items/20000305\\_ap\\_haney.html](http://www.genetics-and-society.org/resources/items/20000305_ap_haney.html), last accessed 8 January 2005.
2. Jurassic Park, dir. Steven Spielberg, co-producers Kathleen Kennedy and Gerald R. Molen (1993), available from Universal Pictures.
3. It is important to note, that many scholars would in fact argue the opposite — that biotechnology is a very old technology stemming back to the origins of agriculture, fermentation and animal husbandry.
4. Katherine N. Hayles, *How We Became Post-Human: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999) p. 284.
5. Eugene Thacker, "Data Made Flesh: Biotechnology & the Discourse of the Posthuman", *Cultural Critique* 53. Available online at <http://www.upress.umn.edu/journals/cc53.html>, last accessed 8 January 2005.
6. Elizabeth Grosz, *Volatile Bodies: Towards a Corporeal Feminism* (Australia: Allen & Unwin, 1994) p.22.
7. While I am arguing for a widespread acknowledgement of the bodies in biotechnology — I am inadvertently provoking further contentious debates surrounding biotechnological bodies that are already prioritized in the public sphere. I am speaking of patient bodies — and unborn bodies, foetuses. If not properly managed, my

assertions may prove damaging to gains made in other areas of ethics and human rights. My intention is not to contribute more fodder to a black and white debate, but instead to ask others to join me in viewing these issues from a position outside of the current anthropocentric gaze and imagine the significance of all the bodies intersecting at the site of biotechnology. To consider each cell, every plant, ecosystem, and animal (and by extension each patient and foetus) as an emergent body of varying verisimilitudes in interaction with each other — sometimes growing, sometimes colliding, sometimes dying — as life. I am arguing that we need to truly embrace the murky, messy, and sometimes violent processes of living. I am suggesting that instead of adopting a dialectical model for arguing the over-specialized field of biotechnology we create a site and a body of language that invites the public to participate and formulate complex opinions and understandings for themselves about each specific embodied technological practice that constitutes the field of biotechnology.

8. Adam Zaretsky, “The Workhorse Zoo Art and Bioethics Quiz”, *Emutagen*, <http://emutagen.com/index.html>, last accessed 8 January 2005.
9. Oron Catts and Ionat Zurr, “Growing Semi-Living Sculptures”, *Leonardo*, Issue 35:4, p. 366 (August 2002).
10. Kira O’Reilly, “Marsyas — running out of skin”, presented at the Bio Difference conference, Biennial of Electronic Arts Perth, 11 September 2004, p.1.
11. As above, p.5.
12. As above, p.7.

### ***Author Biography***

Jennifer Willet is an artist, a faculty member in Studio Arts and a Ph.D student in the Interdisciplinary Humanities program at Concordia University (Montreal, Canada). Her work explores notions of self and subjectivity in relation to biomedical, bioinformatics, and digital technologies with an emphasis on social and political criticism. She has exhibited and presented her research extensively across Canada and internationally.

Since 2002, Willet and Shawn Bailey have collaborated on an innovative computational, biological, artistic, project called *BIOTEKNICA*. *BIOTEKNICA* has been exhibited in various forms at the Break 2.3 Festival, Slovenia (2005), Biennial Electronic Arts Perth, Australia (2004), The European Media Arts Festival, Germany (2003), La Société des arts et technologiques (SAT) Montreal, Canada (2005), and The Forest City Gallery London, Canada (2004), amongst others. In addition, *BIOTEKNICA* has been presented in interviews and conferences at multiple venues across Canada and in France, Australia, Scotland, Germany, and Spain. *BIOTEKNICA* research has been conducted during residencies at The Banff Centre for the Arts in Banff, Canada (2002) and SymbioticA, The University of Western Australia, Perth, Australia (2004, 2006).

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*“... the highbrow hot spot of cyberspace ... a digital bible for the lowdown on the [hi-tech] art scene.” –Wired*

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