Spinning a Yarn of Bioart and Labour

by

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Abstract

The emergence of craft-based tissue culture works throughout the past decade circumscribes this investigation. In particular, I look at recent works by Kira O'Reilly, Julia Reodica and Tissue Culture and Art Project where craft and folkloric arts are introduced into the laboratory environment. Teasing out juxtapositions within these works, I discuss the contrasting forms of labour they contain: traditional women's work, or social reproduction, and highly masculinised realms of big science and biotechnology. By evoking gendered conceptions of labour and value, I suggest that these works critique differing levels of value accorded to such categorizations. Through introducing highly visible elements of subjectivity into their biotechnological projects, I also argue that these works begin to unravel scientific conventions of objectivity. Thus focused, this paper traces histories of craft-based tissue culture work and explores the productive potential within these critical artistic practices.

Keywords: Labour · Craft · Biotechnology · Gender · Agential Realism · Mechanical Objectivity · Biomaterial Labour

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The Ovidian tale of *The Transformation of Arachne into a Spider*, which appears in the larger collection *Metamorphosis*, features one of the earliest depictions of craft as subversion. Throughout *Metamorphosis* weaving routinely functions as a source of female expression and identity[1]; Arachne, a prodigious weaver, exemplifies this tendency. In an act of defiance she refuses to credit her talent to the goddess Pallas Athena, thereby dismissing Athena's authority, and challenges her to a competition of skill.[2] The weaving Arachne produces for this duel, which blasphemously illustrates the gods' sexual transgressions, displays greater virtuosity than Athena, but the spitefully jealous goddess punishes Arachne by transforming her into a spider.[3] Arachne's tapestry unfurls the first illustration of critical craft - a movement that has continued well into the present day. Today, however, the terms of engagement have changed. Condemning depictions of the Gods bolstered with technical mastery are no longer the criteria for contemporary subversions. Instead, artists employing traditional craft techniques have infiltrated the increasingly powerful field of biotechnology to explore its more contested aspects. The medium of subversive craft is no longer threads of fibre, but strings of DNA; the fabric is no longer constructed of warps and wefts, but of cells and tissues. With these tools, tissue culture artists traverse the boundaries of human and non-human so irreparably enforced on Arachne. Within this paper I explore this subversive realm, focusing on artists who introduce traditional craft techniques

[1] Homer's *Odyssey* presents the earliest ancient example I can find of this relationship between craft and female expression, with Penelope depicting her evasion of previous suitors.
[2] Ovid, *Metamorphosis,* trans. Charles Martin (New York: W.W. Norton & Company, Inc.: 2004), 198.
[3] Ovid, *Metamorphosis*, 194.

such as weaving or lace making into the laboratory environment. I argue that through this juxtaposition, feminist practitioners of bioart offer critical resistance and reflection on biotechnology. Through craft they offer themselves in protest.

Introduction

In order to explore the interrogative aspects of feminist bioart, I consider work by Kira O'Reilly, Julia Reodica, and Tissue Culture and Art Project. The Tissue Culture and Art Project, founded by Oron Catts and Ionat Zurr, are the most senior practitioners within this group. Based in Australia, the duo founded the SymbioticA artistic laboratory at The University of Western Australia, which encourages cross-disciplinary research among fine art and the life sciences. Here, they created their *Semi-Living Worry Dolls*. These dolls are versions of the folkloric Guatemalan dolls constructed with a polymer scaffolding seeded with mouse endothelial cells and incubated inside an "artificial womb."[4] The resultant fleshy figurines mirror their child-like namesakes in funhouse fashion, hovering uncomfortably between the realms of the living and the inanimate. An occasional collaborator with Catts and Zurr, artist Kira O'Reilly similarly introduces traditional "women's work" into the lab environment in her project *Marsyas: Running out of skin*. Here, she attempted to use her own skin cells to replicate processes of lace making, thereby creating a "living lace."[5] Also experimenting *in vitro*, Julia Reodica created unisex hymens from

[4] Oron Catts and Ionat Zurr, "Growing Semi-Living Sculptures: The Tissue Culture & Art Project," *Leonardo*, vol. 35, no. 4 (2002): 367-368.
[5] Kira O'Reilly, "Marsyas – Beside Myself," in *Sk-interfaces: exploding borders: creating membranes in art, technology and society,* ed. Jens Hauser (Liverpool: FACT: Liverpool University Press, 2008), 148.

a culture of her vaginal cells – similarly fusing herself into the work.[6]

While bioart transmogrifies Ovidean myth into the phantasmagorical realm of hybrids and semi-living sculptures, the tensions within these works extend beyond the individual defying authority. Questions about notions of value attached to gendered forms of labour are raised: how much do ideas of gender attached to these categories influence their import? Furthermore, these craft-based works of biotechnology disregard scientific ideals of a removed and objective experimenter/subject (found in conventional scientific objectivity) to question how these values are underpinned and the possibility of actually achieving neutrality. Feminist bioartists retrace the historical halls of women's work to subversively read its shifting foundations since biotechnology's onset. Through this mapping, they question science's ability to truly expunge the social.

The divergent realms of labour explored within these works are folkloric craft-based processes contrasted by the institutionalized and highly specialized realm of biotechnology. Traditionally the domain of women, the former includes textile arts such as lace making and constructing traditional dolls. When performed within the home, textile and craft production remain unwaged and largely ignored; they are outside circulated registers of history. Because these forms of work – marked by their connection to women - were routinely rendered invisible and resultantly denied status or recognition, feminist theorists during the 1990s fought

[6] Julia Reodica, "Feel Me, Touch Me: The *hymNext* project" in *Sk-interfaces: Exploding Borders: Creating Membranes in Art, Technology and Society,* ed. Jens Hauser (Liverpool: FACT: Liverpool University Press, 2008), 73.

to have these work processes described as "social reproduction." Through this naming, the work was offered a space of its own. Theorists Kate Bezanson and Meg Luxton explain that, "the concept of social reproduction refers to the processes involved in maintaining and reproducing people, specifically the labouring population, and their labour power on a daily and generational basis."[7] These processes of reproduction are not limited to the biological, but encompass provisions of food, shelter, transmissions of social values, and so on.[8]

Unlike craft and textile work, scientific discourses have tended to evoke distinctly masculine traits. Historians Mary Rosner and T.R. Johnson emphasize that binary relationships exist within scientific experiments, noting that: "an active investigatory and a passive subject are locked in a largely hierarchical and adversarial relationship, with science apparently controlling a powerless, distanced, and female nature."[9] This trope of science as the masculine investigator and nature as the feminine mystery awaiting comprehension emerges within an art historical context quite early, in works such as Louis-Ernest Barrias' 1899 sculpture *Nature Unveiling Herself Before Science.* Here Nature, anthropomorphized into an elegant, modest female, casts her eyes downwards as she willingly begins disrobing. With all the submissive eroticism of a Venus sculpture, the work's power dynamic becomes resoundingly clear. Connected to this subject/object relationship, Evelyn Fox Keller notes the:

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[7] Bezanson and Luxton, *Social Reproduction*, 3.
[8] Ibid.
[9] Mary Rosner and T.R. Johnson, "Telling Stories: Metaphors of the Human Genome Project," *Hypatia,* vol. 10, no. 4 (Autumn, 1995): 105.

> 'Images of mastery' used throughout the discourse of science, the battling heroes, or wrestlers, or hunters… within this perspective, science and its ally technology are said to be 'based… on exploitation of and domination over nature, exploitation and subjection of women, exploitation and oppression of other peoples.'[10]

This hyper-masculinzed trope of domination becomes a point of contention within feminist science studies and feminist bioart. Subsequently, feminist bioartists attempt to maintain an awareness of science as a practice influenced by social convention and gender norms without suggesting it is a purely cultural and relative phenomenon.[11] They dance between nature and nurture.

Figure 1: Louis-Ernest Barrias, *Nature Unveiling Herself Before Science*, 1899 (at Musée d'Orsay, Paris).

[10] Ibid.

[11] Nina Lykke, "Feminist Confrontations with Science," in *Between Monsters, Goddesses and Cyborgs,* eds. Nina Lykke and Rosi Braidotti (London: Zed Books, 1996), 20.

The emphasis within these works on engaging with craft-based processes of social reproduction hints towards one of the most complex relationships between social reproduction and biotechnology: sexual reproduction and assisted reproductive technology [ART]. Emerging out of the final days of the 1970s, ART procedures began with in vitro fertilization and embryo transfer[12], before developing more complicated derivatives such as gamete intrafallopian transfer. Whereas processes of fertilization and gestation once existed under the umbrella of social reproduction, they have increasingly migrated into biotechnological realms. While reproductive technologies clearly provide desired assistance to prospective parents, they can simultaneously fragment the female body in ways that facilitate forms of ownership or, in philosopher and activist Vandana Shiva's phrasing, contribute to a "colonization of interior spaces."[13] Bodies offer new territory to be divided and conquered – an interior *terra nullius*.[14]

The juxtaposition between traditionally unwaged work and the employment of microscopic organisms interplays with two concepts developed by Karl Marx: the species being and zero-work. Within the concept of the species being, Marx argues that productive activity is an inimical and essential historical aspect of being human, however, the capitalist system commodifies this productive capacity and

[12] RC Edwards and PC Steptoe, "Birth after Reimplantation of Human Embryo," *Lancet,* vol. 312, no. 8085 (1978): 366.
[13] Vandana Shiva, *Biopiracy: The Plunder of Nature and Knowledge* (Boston: South End Press, 1997), 5.
[14] Shiva draws parallels between the colonial usages of *terra nullius* and the patenting of biological materials throughout *Biopiracy.*

source of fulfilment leading to a devaluation of man's species life.[15] Theorist Eugene Thacker re-examines this concept in his book *The Global Genome: Biotechnology, Politics, and Culture.* Here, he explores the biotech industry within the larger context of globalization and traces shifts within the understanding of labour as it relates to biotechnology.[16] Thacker suggests that when we consider Karl Marx's concept of the "species being" alongside the advent of molecular biology there is an additional level of alienation experienced.[17] Although humans work within the biotech field (researchers, lab techs, etc.), work also consistently occurs on a molecular level; enzymes are used for splicing, protein synthesis is catalyzed and so on. Thacker terms this constant and foundational process of labour "biomaterial labour."[18] The irreproducibility of biomaterial labour distinguishes it from other forms of technologized work such as programming or factory line production; humans could never complete the work done on a molecular level within biotechnology. This additional level of production and further degree of alienation raises questions about who or what is actually responsible for the work within the biotech industry.

Contrasting the inimical yet commodified nature of the species being, Gayatri Spivak cites "women's work" as the primary example of Marx's notion of zero-work: work that lies outside of wage-work and outside of "the definitive modes of

[15] Eugene Thacker, *The Global Genome: Biotechnology, Politics, and Culture.* (Cambridge: MIT Press, 2006), 30.
[16] Ibid., 21-40.
[17] Ibid., 30.
[18] Ibid., 40.

production."[19] These are roles, not jobs - responsibilities, not careers. An interesting reversal of Thacker's argument occurs here: while Thacker suggests that the naturally occurring intra- and inter-cellular reactions of biomaterial labour constitute a form of work worthy of recognition, processes of social reproduction are work cast as nature. David Staples investigates women's work as a category of zero-work and argues that:

> The specter of women's work haunts capitalism. From women and children being set to work in the nineteenth century by what Karl Marx called the 'invisible threads' of capitalism to today's globalized homeworkers, domestic workers, and caregivers, the hidden, invisible, and cyclically forgotten labour of women – derogated by Marx as a natural and thereby 'freely appropriated' force of social production – marks a recurring, ghostly passage through materialist formulations of subjectivity, history, and culture.[20]

The onset of biotechnology and information come into conversation with the already contested realm of women's work.

However, the movement to contextualize and recognise women's work as social reproduction emerges contemporaneously to another form of work previously unaccounted for in classical Marxism: affective labour. Christine Wertheim interrogates this development, noting that:

> In the parlance of neo-Marxism, the Work of producing profit-generating non-objectal commodities and services is known as affective or socialized labour – and since the 1970s it has been formally included in the productive economy – as the female thinkers of this tradition have made clear, from mothers and caretakers, to prostitutes and secretaries, women have always been '***social***' workers and always trafficked in the labour of the immaterial… yet it is not until men enter this field during the information revolution that

[19] David Staples, "Women's Work and the Ambivalent Gift of Entropy," in The Affective Turn: Theorizing the Social, eds. Patricia Ticineto Clough and Jean Halley (Durham: Duke University Press, 2007), 119.
[20] Ibid.

> such work is recognized as having the capacity to produce monetary profit, that is, as value-producing.[21] [Emphasis original.]

This disjunction lies at the heart of my discussion. Whereas affective and biomaterial labour are seen as value producing and recognized accordingly, the similar, yet gendered, realm of social reproduction is cast as a natural expression of femininity. The bioartists I will be discussing plumb techniques and approaches from each of these forms of labour and place them into conversation with one another. I suggest that these works avoid reifying the scientific technologies they aim to interrogate specifically through the artists' use of themselves as both subject and object.

Before beginning, however, I would be remiss to overlook the slightly unusual nature of my viewership, which has never occurred in person. Clearly forsaking the art historical adage of writing only about what one has seen, my connection to the works I focus on has been filtered through time and space and made possible only through bytes and pixels. In large part this removal speaks to some of the durational issues that arise with tissue culture work, and the resultant importance of digital dissemination. I would not suggest, however, that my relationship with the work suffered from its digitised nature. In fact, the relationship between the biological and the digital has been the focus of some discussion of late. Contrasting Walter Benjamin's suggestion that reproductions lack the "aura" of the original, Thacker notes that a particularly inimical and complex

[21] Christine Wertheim, "Craft-Work: A sampler of musings on art and labour in the Information Age or how to make alternations in global financial fabrics," *n.paradoxa,* vol. 27 (2011): 78.

relationship exists between the circulation of biological information and the digital.[22] Besides, when dealing with work that interrogates the onset of the "information revolution" surely digital experience functions as reliably as any other.

[22] Thacker, *The Global Genome,* 121.

Historical Context

Throughout the 1980s and 1990s fusions of artistic and biological disciplines became increasingly frequent, and facilitated a precedent of interdisciplinary collaboration that benefits the artists I will be examining.[23] In its nascent phases, bioart employed both genetic code, through the manipulation of life materials, and programming languages, through software and robotics-based projects. One of the earliest practitioners to cross the disciplinary divide was Norman White, who had originally studied biology at Harvard, and began experimenting with new media and robotic art during the late sixties.[24]

Historian Robert Mitchell suggests that during the 1970s new developments in molecular biological techniques of genetic manipulation sparked the interests of artists.[25] Representative of this, artist Joe Davis began collaborating with molecular biologists at Harvard and Berkeley on a project creating and shaping DNA nucleotides.[26] These cross-disciplinary experimentations continued throughout the following decades, becoming increasingly pertinent as the biotechnology industry grew.

The interplay within these early works between the realm of biology/life materials and robotics projects/programming code underscores the intersection between these forms of informational patterns. As early as the 1940s, physicist

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[23] Robert Mitchell, *Bioart and the Vitality of Media* (Seattle: University of Washington Press, 2010), 41.
[24] Caroline Langill, "Interview with Norman White," *Shifting Polarities,* La fondation Daniel Langlois, http://www.fondation-langlois.org/html/e/page.php?NumPage=1928.
[25] Mitchell, *Bioart and the Vitality of Media,* 41.
[26] Ibid., 42.

Erwin Schrödinger suggested that genetic material could be described as a "hereditary code-script,"[27] and this rhetoric has continued to surround DNA from Watson and Crick's 1953 papers to the developing field of bioinformatics.[28]

This relationship features strongly within the early work of transgenic artist Eduardo Kac. Kac's *Genesis* project from 1998/1999 explores "the intricate relationship between biology, belief systems, information technology, dialogical interaction, ethics, and the Internet."[29] The work takes a sentence from Genesis, which reads "Let man have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moves upon the earth," and translates this phrase into Morse code. It then converts the Morse code into DNA base pairs, thereby synthesizing an "artist's gene." A bacterial colony containing this code was then bioengineered, and projected within the gallery, where remote viewers could activate ultraviolet lights that would further change and mutate the bacteria. The work addresses both the rhetoric of dominion surrounding biotechnology, and the translatable nature of genetic code into different code languages.

This mounting presence of biotechnology within the public sphere reached new levels with the Human Genome Project (HGP), which emerged in the 1980s.[30] Although the trend towards "big science" emerged after World War II and intensified during the Cold War, historian Marli Huijer notes that the HGP marks

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[27] Erwin Schrödinger, *What is Life?* (Cambridge: University of Cambridge Press, 1967), 20-22.
[28] Thacker, *The Global Genome*, 51-52.
[29] Eduardo Kac, "Genesis," in *Genesis* (Linz: O.K. Center for Contemporary Art, 1999), 45.
[30] Marli Huijer, "Reconsidering Democracy: History of the Human Genome Project," *Science Communication,* vol. 24, no. 4 (2003): 483.

molecular biology's first "worldwide big science project."[31] The project mapped and sequenced the entire human genome to garner information that could shed light on causes of genetic disease and potentially aid preventative measures.[32] However, the rhetoric employed throughout the HGP has been criticized. Rosner and Johnson suggest that some of the metaphors employed by the HGP seemed "to exemplify the 'progressivism' that wants to conquer and transform a potentially profitable nature… Thus, the Project clearly represents an exploitative science story, the kind that reflects 'basically the same old patriarchal fears and dreams."[33] Of course, it is important to underscore how distinct the realms of the HGP and its criticisms truly are. While establishing the colonial aspects of mapping identifies an important and problematic undertone, this approach of nomination extends well beyond the scientific realm. Rather, this method indicates a kind of being in the world.[34] In *The Order of Things,* Foucault classifies the "nomination of the visible" as an essential part within the discourse of natural history: "nature is posited only through the grid of denominations, and – though without such names it would remain mute and invisible."[35] We operate on such a level of complicity with the approach of the HGP that it becomes impossible to dissociate or distance ourselves entirely.

[31] Ibid., 479.
[32] Ibid.
[33] Rosner and Johnson, "Telling Stories: Metaphors of the Human Genome Project," 106.
[34] The echoes here of Martin Heidegger's *In-der-Welt-sein* are somewhat intentional. Heidegger speaks to break down or overcoming of subject/object relations, however the rhetoric of the HGP relies on a strict delineation between the two.
[35] Michel Foucault, *The Order of Things* (London and New York: Routledge, 2002), 138-177.

Concerns associated with this project were explored and predicted by Canadian artist Nell Tenhaff, whose work figures as an important historical precedent for the material I will be examining more closely. As early as 1989, in her work *Species Life*, Tenhaff questions suggestions that complex cultural constructs such as gender binarisms can be reduced to distinctions within genetic code. Tenhaff continued investigations relating to gender and biotechnology well into the nineties, perhaps most directly in the work *The solitary begets herself, keeping all eight cells.* Here, through evoking parthenogenesis, Tenhaff presciently touches on the complex relationship between the female body and biotechnology since the development of reproductive technologies.

Critical Art Ensemble also explored concerns with reproduction technologies by creating interactive and performative works that explored "the latent residue of eugenics in the fertility market."[36] The earliest of these projects, organized in 1997-1998, was titled *Flesh Machine*. Here, the suitability of audience members' genes were tested to determine their potential inclusion in a donor program. Artistic group SubRosa have also addressed links between eugenics and reproductive technologies.

These earlier examples of interdisciplinary exploration between scientists and artists, and the exploration of biotechnology as it pertains to women's bodies and reproductive technologies legitimized bioart as a form of critical commentary and laid the foundations for the most recent emergence of women bioartists.

[36] "Biotech," Critical Art Ensemble, accessed May 7, 2012, http://www.critical-art.net/Biotech.html.

Kira O'Reilly: *Marsyas: Running out of skin*

In 1886, twenty-eight-year-old Emma Laflamme, a young woman from the quiet town of Winchester, Ontario, began maintaining a diary. She recorded her daily activities and various preparations for her sister's upcoming wedding.[37] Although updated for only a brief nine months, the diary mentions her pastime of lacemaking several times.[38] "I gave Katie a lace collar last week," she wrote, "yesterday [I] was busy… before it was too dark in the afternoon for anything like lace work."[39] A later entry remarks on this necessity of light, as Laflamme complains that once finished her more demanding chores she has "no pick up work now."[40] After abandoning journal writing, Laflamme continued with her lacemaking and domestic duties while she kept house for her parents, who ran a store in town.[41] She lived there into her nineties without marrying or having children. We know little of Laflamme's life beyond her brief writings; we know it only through traces.

A century later, artist Kira O'Reilly worked at the SymbioticA art and science research laboratory at the University of Western Australia for ten months endeavoring to create living lace using her own skin.[42] Despite enormously different contexts, O'Reilly's project offers a fascinating parallel to the hours spent by Laflamme threading and stitching before the dying light. While Laflamme spent the

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[37] Frances Hoffman, *Much to Be Done: Private Life in Ontario from Victorian Diaries* (Aurora: Natural Heritage/Natural History, 2007), 252.
[38] Ibid.
[39] Ibid., 89-90.
[40] Ibid.
[41] Ibid., 252.
[42] Kira O'Reilly, "Marsyas – beside myself," in *Sk-interfaces: Exploding Borders: Creating Membranes in Art, Technology and Society,* ed. Jens Hauser, (Liverpool: FACT: Liverpool University Press, 2008), 97.

entirety of her ninety-odd years in Ontario, O'Reilly represents the globalized art world, flying from her home in the United Kingdom to work on a project in Australia that was subsequently discussed and researched across the world. Whereas details of Laflamme's life story can only be found because of local historian Frances Hoffman's research and transcription of her brief journal, elements of O'Reilly's lacemaking attempt have been detailed in numerous academic journals and across the Internet. And yet, despite being worlds apart, the story that emerges through an examination of O'Reilly's work hints towards the quiet, largely forgotten hours detailed in Laflamme's journal.

In order to produce her lace O'Reilly planned a biopsy of her skin, which she intended to culture and grow into delicate woven strands.[43] Although her work routinely interrogates the status of the body, building lace out of tissue represents a significant shift within O'Reilly's oeuvre. This was the first time her practice occurred "in a laboratory and working with the technologies of tissue culture and also the textile craft of lace making."[44] However, the project builds on her earlier explorations of the mutable and malleable state of the human and non-human body. Transforming skin tissue from body part to artistic medium, O'Reilly's project mirrors the mythological character Arachne's defiantly godless tapestry, which criticized, rather than celebrated, divine power.

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[43] Ibid.
[44] Kira O'Reilly, "Piginess Fantasies," *Hybrid Reflections*, accessed February 13, 2012, http://www.ibmc.up.pt/hybrid/content.php?menu=6&submenu=43.

The inspiration for O'Reilly's lace making project was not Arachne, however, but another Ovidian character: Marsyas.[45] Within *Metamorphosis*, Apollo flays the satyr Marsyas (a goat and human hybrid) after defeating him in a musical dual.[46] After this flaying Ovid describes Marsyas as "one whole wound," emphasizing the intensity and brutality of the torture.[47] O'Reilly explains that, for her, this account "became a reflection of the cultural anxieties centered around frontiers of body exploration."[48] Indeed, the grotesque physicality of Marsyas' punishment warns against the usurping tendencies of threatening hybrid forms.

While O'Reilly's project, titled *Marsyas: Running out of skin*, employs the frontiers of biotechnological work, it simultaneously harkens back to the pastime of lacemaking detailed throughout the journal of Emma Laflamme. Originally produced in convents, the production of lace flourished in Italy and Flanders during the early 16th century.[49] Throughout the 18th and 19th centuries, lacemaking was a popular form of decorative handiwork.[50] Historian Francis Hoffman notes that, "Young women higher on the social scale were taught that it was always wise to have something to occupy oneself, since 'idle hands were the devil's playground.'"[51] In the Toronto-published religious magazine *The Cottager's Friend*, Mrs. L.H. Sigourney extolled the value of such pastimes:

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[45] O'Reilly, "Marsyas – beside myself," 96.
[46] Ovid, *Metamorphosis*, 205.
[47] Ibid.
[48] Kira O'Reilly, "Piginess Fantasies."
[49] Palliser, "Lace: Part I," *The Decorator and Furnisher*, vol. 16, no. 4 (July, 1890): 138.
[50] Ibid.
[51] Hoffman, *Much to Be Done,* 88.

> Needle-work in all its countless forms of use, elegance and ornament has been the appropriate occupation of women… the numerous modifications of mending are not beneath the notice of the most refined young lady. A very sensible, rational self-complacency arises from the power of making 'auld claiths look amaist as well as new.'[52]

Despite its prescriptive moralizing qualities, the production of lacemaking remained largely within the home and outside of the realm of waged production. Like numerous other forms of craft production, this domestic nature renders lacemaking beyond the realm of industry, and categorizes it as "zero-work." Including other forms of women's work, such as caring for children and the elderly, housework, and sexual reproduction, these forms of zero-work are cast as reproduction, the ghost effect of production that allows for production to garner value. As underscored by Marxist feminist Leopoldina Fortunati: "The real difference between production and reproduction is not that of value/non-value, but that while production both *is* and *appears as* the creation of value, reproduction *is* the creation of value that *appears otherwise.*"[53] In this sense, the quiet hours women spent nestled next to windows weaving and threading were more productive than even Mrs. L.H. Sigourney could have imagined; the lace decorations made to make them stand out simultaneously produced their invisibility.

Yet despite the invisible and increasingly anachronistic nature of lacemaking, O'Reilly chose to make it visible within the realm of the biotechnological, an effort mirroring those of earlier feminist theorists. In particular, the development of the

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[52] Ibid.

[53] Leopoldina Fortunati, *The Arcane of Reproduction: Housework, Prostitution, Labour, and Capital*, trans. Hilary Creek, ed. Jim Fleming (Brooklyn, NY: Autonomedia, 1995), 8.

term "social reproduction" fought to describe, and thereby make visible, the realm of traditional women's work. As described by Kate Bezanson and Meg Luxton:

> The concept of social reproduction refers to the processes involved in maintaining and reproducing people, specifically the labouring population, and their labour power on a daily and generational basis.[54]

Social reproduction includes a wide variety of forms of production, which are connected through their female practitioners.

We see a similar effort to *make visible* within O'Reilly's work, yet the realm of social reproduction (or, alternatively, zero-work) appears juxtaposed with the highly valued and lucrative realm of biotechnology. While this combination serves to highlight the differing treatment of these two realms of work, it also points towards another development: the increasing subsumption of these forms of labour into capital.

Theorist David Staples categorizes this process of transformation under the "*real* subsumption of labour," wherein "capital has internalized labour in its own specifically capitalist sociality and mode of production."[55] The subsumption of social reproduction into capital depends upon a shift argued by Antonio Negri and Michael Hardt:

> While classical political economy understood the extraction of value from surplus labor to produce a measurable profit – which, when reintroduced into productive circulation, became capital – … in the late twentieth century, money (capital's forceful claim on future labor) has broken free of

[54] Bezanson and Luxton, *Social Reproduction*, 3.
[55] David Staples, "Women's Work and the Ambivalent Gift of Entropy," in *Affective Turn: Theorizing the Social,* ed. Patricia Ticineto Clough (Durham: Duke University Press, 2007), 124.

> production… [and] now launches an entirely new regime of exchange. Money as the 'claim on future labor' assumes a more expansive role…[56]

As Staples explains, this shift has altered the antagonism between necessary and surplus labour substantially, rendering labour time meaningless and displacing value production onto affect. Staples argues:

> The antagonism focused on the factory floor in Fordism has extended to all sites of capitalist society: the home, the office, transportation, the Internet, health care, education, child care, popular culture... Affective [immaterial] labour is meant to highlight the permeability of the line between paid and unpaid labor… On the other hand… value is now being produced more or less everywhere and all of the time…[57]

However, this increasing transition of the realm of social reproduction into the realm of immaterial/affective labour does not translate into recognition of domestic work historically performed by women (or even unwaged domestic work contemporarily performed by women). To reiterate Wertheim's observation, "women have always been '***social***' workers and always trafficked in the labour of the immaterial… yet it is not until men enter this field during the information revolution that such work is recognized as having the capacity to produce monetary profit, that is, as value-producing.[58] Like lace decorations on dresses, women's work becomes visible and invisible. Knit one; drop two.

Beyond this unequal accordance of value, the tensions that exist between work performed by women and biotechnology are drawn out through the juxtaposed notions of progress encompassed within biotechnology. Throughout the

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[56] Ibid., 122-123.
[57] Ibid.
[58] Christine Wertheim, "Craft-Work," 78.

development of various technologies, both biological and non-, there exists an "idea of progress and the liberating role technology plays in reducing labour and transforming women's lives for the better."[59] However, as explored by historian Randi Markussen, the notion of 'easiness' connected to these technologies is often complicated, as "Technology is not only equated with labour-saving; it also means timesaving. Time saved is not regarded as a useless emptying of time. Time saved is time that opens up for new options and possibilities."[60] In essence, the labour-saving nature of technology increases expectations of availability and efficiency.

Grown in specific conditions, fed, maintained and carefully watched, the cell cultures developed within works of bioart obtain a childlike status requiring the care and attention of their watchful parents. Varying levels of care exist in all laboratory settings, however artists use of their own cells link them to their projects in a particularly intimate, familial manner. This undertone of nurturing permeates the work; each artist isolates aspects of themselves and cares for and develops them until they become something on their own. The artistic role, in this sense, is as much the parent as the autonomous creator.

O'Reilly's *Marsyas* project was never fully completed, however, due to the difficulty of finding a surgeon willing to perform the biopsy necessary for the project and resultant time restrictions. Biopsy procedures – particularly of the skin – are quite routine and unintrusive, usually performed with just a local anesthetic.

[59] Randi Markussen, "Constructing Easiness – Historical Perspectives on Work, Computerization, and Women," in *The Cultures of Computing*, ed. Susan Leigh Star (Oxford: Blackwell Publications), 159.
[60] Ibid., 160.

Considering the range of elective cosmetic surgeries available to the willing female body it seems disappointing, yet not entirely surprising, that an elective procedure for artistic purposes could not be arranged. Interplay between capital and practice becomes apparent within this refusal: economic entanglements offer both forms of justification and support. Elective cosmetic procedures are obtained through a clearly defined protocol; appointments are made and down payments are delivered. Thus easily secured, the values underpinned through these surgeries are reified through the economic system they circulate within. In this process, ideals of beauty become materialized through economic exchange. By contrast, securing a skin biopsy for artistic reasons has no economic precedent or support, and enters foreign territory of elective, yet not cosmetically motivated, procedures.

Like the work of lacemakers who preceded her, little documentation remains of O'Reilly's *Marsyas* project. We know the work through the exhibition writings and interviews; we know it only through traces.

Julia Reodica: *hymNext*

The work of artist Julia Reodica continues to ruminate on notions of gender and biotechnology. With a background in the medical field, Reodica's artistic practice educes connections between the social and scientific cultures.[61] Her work acknowledges that scientific values are not entirely disconnected from social values, but that the two mutually constitute and influence one another. Her work grows *in vitro* within the laboratory, yet it feeds on the social anxieties and fears that surround, and attempt to police, the female body.

Reodica's emphasis on the interrelated nature of the social and the scientific contributes directly to the critical and reflexive nature of her work. Contemporary bioart, and particularly tissue culture work, offers an investigation and subversion of the scientific emphasis on objectivity and accountability. As explored by science historians Lorraine Daston and Peter Galison, a particular approach to objectivity has come to define scientific practices:

> To be objective is to aspire to knowledge that bears no trace of the knower – knowledge unmarked by prejudice or skill, fantasy or judgement, wishing or striving, objectivity is blind sight, the 'objective view' that embraces accidents and asymmetries.[62]

This sense of removal and impartiality characterises scientific experiments and their representations; an objective scientist can be traced by their invisibility.

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[61] "About," Phoresis, accessed February 14, 2012, http://www.phoresis.org/index.php?option=com_content&view=article&id=22&Itemid=34.
[62] Lorraine Daston and Peter Galison, *Objectivity* (Brooklyn: Zone Books, 2007), 17.

For philosopher Isabelle Stengers, this desire for objectivity requires a tacit agreement between scientists.[63] She suggests that science experiments are a process of selecting and excluding various categories from the experimental apparatus and therefore act on a "local and selective" level.[64] The laboratory provides an arena for the active "re-creation" of phenomena that has been "purified"; removed from the messy outside world where variables cannot be easily controlled.[65] She suggests that, within this environment, "the scientist poet 'creates' his object; he fabricates a reality that does not exist as such in the world but is rather on the order of a fiction."[66] While countless fictions can be created, they are only accepted as objective based upon their ability to silence scepticism and thereby overthrow other fictions.[67] Objectivity functions through an act of complicity. In Stengers's account, scientists thus occupy the roles of "poet and judge"; they must be able to re-create their phenomena and ensure it can "testify in relation to the natural."[68]

The judicial component of Stengers's account of scientific practice informs philosopher and physicist Karen Barad's description of objectivity as a means of "boundary-drawing."[69] The scientific experiment is a practice in delineation. Lines are drawn between the observer and the observed; the bounds of the experiment

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[63] Isabelle Stengers, "Who Is the Author?" in *Situating Science: Power and Invention,* trans. Paul Bains (Minneapolis: University of Minnesota Press, 1999), 159.
[64] Ibid., 158.
[65] Ibid., 163.
[66] Ibid.
[67] Ibid.
[68] Ibid.
[69] Karen Barad, *Meeting the Universe Halfway* (Durham: Duke University Press, 2007), 208.

and the eliminated "parasitic effects."[70] Contrasting scientific practices, which are "boundary-drawing,"[71] I suggest that bioart enacts a "boundary-blurring practice." Artists using their own tissue cells offer more literal interminglings of subject and object. For Barad, this relationship between the scientific experimenter and their object is one of "mutual constitution of entangled agencies," a process she terms "intra-action."[72] Intra-action forms the main ontological shift identified by Barad, who explores this process as it applies to scientific processes. For both Stengers and Barad, within scientific experiments practitioners do not passively observe discrete objects, but instead actively involve themselves in a process that generates both subject and object. Within tissue culture art, we see this process of intra-action literalized.

These works of bioart reference an earlier rumination on the subversive power of boundary blurring: Donna Haraway's *Cyborg Manifesto.* Within this canonical text, Haraway identifies three forms of "leaky boundaries" she considers essential to her construction of the cyborg: the boundary between human and animal; between animal-human (organism) and machine; and the boundary between physical and non-physical.[73] For Haraway, these blurred boundaries, and the fictive cyborg creature they facilitate, are filled with productive potential. The projects of O'Reilly, Reodica, and TC&A – both material and imagined – similarly

[70] Stengers, "Who Is the Author?" 163.
[71] Barad, *Meeting the Universe Halfway*, 208.
[72] Ibid.
[73] Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs and Women: The Reinvention of Nature* (New York: Routledge, 1991), 151-153.

navigate the boundaries identified by Haraway. The works can be called neither human nor non-human; they are not self-sustaining organisms, nor wholly synthetic devices. They are the fictions of Stengers and Haraway materialized.

Comprised of glistening orbs, Reodica's *hymNext* project demonstrates these blurred and leaky boundaries. From 2004-2007 Reodica sculpted a series of unisex hymens with "living materials and the artist's own vaginal cells."[74] Relatively unassuming, the circles of fleshy salmon and grey are imprinted with the intersexual combination of both male and female gender symbols.[75] Encased within small, silk-lined chambers the hymens evoke precious jewels. They are reliquaries of the flesh.

Through using her own cells, Reodica functions as both subject and object of the work in the most literal sense. This conflation between artist/work and scientist/object of study evokes the intra-active nature of the scientific apparatus. Furthermore, this intermingling points to the wide-reaching implications of intra-action to human autonomy. As Barad explains, questioning boundaries of apparatuses has particular bearing on conceptions of posthumanism, as the questioning of boundaries can be extended to the boundaries of the human itself:

> Human bodies, like all other bodies, are not entities with inherent boundaries and properties but phenomena that acquire specific boundaries and properties through the open-ended dynamics of intra-activity. Humans are part of the world-body space in its dynamic structuration.[76]

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[74] Julia Reodica, "Feel Me, Touch Me: The *hymNext* project" in *Sk-interfaces: Exploding Borders: Creating Membranes in Art, Technology and Society,* ed. Jens Hauser (Liverpool: FACT: Liverpool University Press, 2008), 73.
[75] Ibid., 74.
[76] Barad, *Meeting the Universe Halfway*, 172.

Reodica displaces an element of her body (deemed particularly integral element in certain cultures), thereby questioning both her relationship to her research, and her relationship to her traditionally autonomous and bounded body.

Although Reodica presents hymens in isolation from their originary organ, they remain connected to social practices that surround them. Unlike Stengers's account of phenomena explored within laboratories these objects cannot be "purified" and their variables cannot be controlled for.[77] They are not afforded this luxury. The presentation of Reodica's hymens illustrates the inextricable link between their social and scientific manifestations. Displayed within detailed and decorative cases, they evoke the enormous value placed upon hymens as indicators of virginity. Reodica parallels their gift-like appearance with the care and trepidation afforded to engagement rings.[78] The bitter irony of both objects being assigned an entirely arbitrary value with devastating consequences permeates this comparison.

In cultures where women are expected to remain virgins until marriage, a hymen that bleeds upon penetration mistakenly functions as evidence of virginity.[79] The intense pressure on women to provide this marker has lead to the widely debated practice of hymen reconstruction surgery.[80] In this context, the scientific and medical community already isolates and manufactures hymens. But hymens are

[77] Isabelle Stengers, "Who Is the Author?" 163.
[78] Reodica, "Feel Me, Touch Me," 74.
[79] Sawitri Saharso, "Feminist ethics, autonomy and the politics of multiculturalism," *Feminist Theory* 4.2 (2003): 207.
[80] Ibid.

not the only part of women's bodies to be isolated in such a manner; the atomization of women's bodies occurs frequently. Historian and writer Jill Lepore noted this tendency during her commentary on the breast-cancer fundraising foundation Susan G. Komen for the Cure's recent (and now redacted) decision to cut ties with Planned Parenthood:

> In American politics, women's bodies are not bodies, but parts. People like to talk about some parts more than others. Embryos and fetuses are the most charged subject in American political discourse. Saying the word "cervix" was the beginning of Rick Perry's end. In politics, breasts are easier to talk about.[81]

Visual synecdoche limns the female body. Debates about ultrasound fetal imaging similarly explore the processes of fragmentation that are enacted through these technologies. As mentioned above, these representations are frequently considered passive observations of the fetus, however numerous feminist scholars dispute this construction of a removed and objective form of observing.[82] Instead, fetal imaging technologies often serve to isolate the fetus from the maternal body in a manner easily adopted in antiabortion activism. Sociologist Laury Oaks emphasises the highly political nature of these representations, explaining that:

> Images of the fetus as autonomous threaten to overshadow the significance of pregnant women's bodies in the reproductive process, devalue the relationship between pregnant women and their fetuses, and represent women as adversaries of their babies-to-be. Of pressing concern is the proliferation of fetal representation that establish the fetus as an actor who

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[81] Jill Lepore, "Komen's Choice," *The New Yorker*, February 2, 2012, http://www.newyorker.com/online/blogs/comment/2012/02/two-sisters-komen-and-planned-parenthood.html.

[82] See Rosalind Petchesky (1987), Valerie Hartouni (1991), Janelle Taylor (1992, 1998), Monica J. Casper (1997), Laury Oaks (2000) and Karen Barad (2007).

> lives beyond the boundaries of a pregnant women's body and inhabits a privileged place in the public imagination.[83]

This manipulated framing of an aspect of women's bodies - influenced by and related to economic, political and cultural ends - mirrors the emphasis placed on the un-penetrated hymen. Both practices encourage focusing on a set of material conditions isolated from their wider relations and the subjectivity or autonomy of the woman in which they reside. Furthermore, both of these framings are made possible and reinforced by technologies used to bolster their existence.

Yet no two fragmentations are entirely the same; their breaks and cracks emerge in different places on different terms. And framing of hymens and foetuses, while related, operate on differing employments of absence and presence. Oaks's description of foetal agency, constructed and supported through maternal invisibility, depends on a sense of absence. It creates through erasure. By contrast, hymen reconstruction, although a reductionary synecdoche, foundationally relies on presence. An intact hymen functions as the woman and her source of value within hymen reconstruction, yet ultrasound technology erases this position entirely. To grasp for a "lesser evil" here would be a losing game, but each practice indulges in its own distinct making and unmaking of bodies.

Reodica's work uses the same apparatus tools as hymen reconstruction, yet its agential cut is wildly different. To a certain extent, the work employs the various

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[83] Laury Oaks, "Smoke-Filled Wombs and Fragile Fetuses: The Social Politics of Fetal Representation," *Signs*, Vol. 26, No. 1 (Autumn, 2000): 63-64.

material-discursive elements present in hymenoplasty, but reads them diffractively (i.e. through one another), thereby questioning the values supported and reinforced through hymen repair.

Relations between the cultural value of hymens and their technological replication through repair surgery are entirely reframed within Reodica's work. Here, reconstruction of the hymen does not contribute to the fragmentation of an individual or represent a solution to patriarchal pressure. Rather, Reodica's *hymNext* project function as a novel object; they are not intended for insertion within a specific individual.[84] Furthermore, by constructing the hymens independent of bodies Reodica disconnects them from the gendered female body and disrupts their value.

Barad welcomes the possibility of subversion within the process of intra-action. She suggests that subversive acts could "include, but are not limited to, changes in the specific material reconfigurations of apparatuses through the enfolding of particular subversive resignifications."[85] Reodica's *hymNext* project functions in precisely this subversive capacity. By reconfiguring the apparatus of hymenoplasty so that she performs as subject and object, Reodica isolates and shifts the signification of the hymen into a context where it can be removed from notions of "purity" and critically examined.

[84] Reodica, "Feel Me, Touch Me: The *hymNext* project," 73.
[85] Barad, *Meeting the Universe Halfway*, 219.

Through blurry and leaky boundaries, bioart contains a particularly productive capacity for subversion and critique. By mining perspectives that are ordinarily excluded from mattering, bioartists are able to enact novel agential cuts that underscore the ongoing (and therefore malleable) nature of intra-action.

Tissue Culture and Project: *Semi-Living Worry Dolls*

Craft, in a decidedly folkloric manifestation, resurfaces within the work of the Tissue Culture and Project (TC&A). An artistic collective comprised of members Oron Catts and Ionat Zurr, the Tissue Culture and Art Project formed in 1996.[86] Based in Australia, they founded the SymbioticA artistic laboratory at The University of Western Australia in 2000.[87] This laboratory encourages cross-disciplinary research between fine art and the life sciences through artistic residencies and workshop programming.[88] SymbioticA's collaboration with Kira O'Reilly on her *Marsyas* project indicates the crucial role that collaboration plays within the relatively small community of tissue culture artists.

With the development of the SymbioticA lab, TC&A began to create numerous projects in 2000 that explored species relations. Perhaps their best-known work, *The Victimless Utopia* created a variety of animal tissue cultures for various forms of consumption to, purportedly, interrogate both human attitudes towards the consumption of animals and the promise of biotechnology to remove the victim from this equation.[89] TC&A suggest these works indicate that, through the construction of this "new class of Semi-Being" they are "creating a new class for exploitation."[90]

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[86] "About Us," Tissue Culture and Art Project, accessed February 28, 2012, http://tcaproject.org/about-us/oron-catts.
[87] Ibid.
[88] Ibid.
[89] Ionat Zurr and Oron Catts, "The ethical claims of Bioart: Killing the Other or Self Cannibalism," *AANZ Journal of Art: Art and Ethics* Vol. 4, No. 2 (2003): 13.
[90] Ibid.

This methodology, enacting the kinds of science fiction-esque promises delivered by biotechnology for the purpose of highlighting their ethical ambiguities and trappings, has been heavily criticized. Artist and ethics advocate Carol Gigliotti suggests that:

> Two assumptions are at work in … much of the writing by both artists and critics about artists working with genetic technologies. The first assumption is that thinking in art is consistently experimental and non-conformist… The second assumption concerns the idea that a confrontation with the complexity of a topic or issue precludes the necessity of confronting ethical choices embedded in that complexity.[91]

Gigliotti contests these assumptions through looking at the work and artist statements of TC&A. In particular, Gigliotti doubts that TC&A can actually challenge perceptions of the distinction between humans and animals while simultaneously operating from a place of privilege because of these divisions. She notes that they are aware of this paradoxical position, as they claim that:

> On one hand we attempt to break down specism and make humans part of a broader continuum. On the other hand, we artists-humans, are using (abusing?) our more privileged position to technically manipulate an aesthetic experiment.''[92]

The possibility that these projects will afford a realization that humans are a part of "the continuum of life,"[93] and thereby make the manipulation of life seem less "alarming" garners little support from Gigliotti. She notes that humans have always been comfortable altering and controlling animal life, and that these projects may

[91] Carol Gigliotti, "Leonardo's choice: the ethics of artists working with genetic technologies," *AI & Society* 20 (2006): 24.
[92] Zurr and Catts, "The ethical claims of Bioart," 17.
[93] Ibid.

simply make audiences more complacent about novel forms of animal manipulation and abuse.[94]

Interestingly, Gigliotti's fear that projects such as *The Victimless Utopia* series will prime viewers to be more accepting, rather than critical, of anthropocentric practices has become somewhat of a reality. At the 2012 annual meeting of the American Association for the Advancement of Science in Vancouver, Professor Mark Post from Maastricht University in the Netherlands announced that by the end of 2012 his group will produce the world's first synthetic burger created from cultured artificial meat.[95] This announcement was met with a range of excitement, scepticism, and disgust. Immediately circulating across social media platforms, a recurring comment on the announcement linked to TC&A's projects and noted, with some regret, that Post's development had been "done before." Gigliotti's warning that this work can increase viewer's complacency seems particularly prophetic. Repetition dissolves outrage into ennui.

Although *The Victimless Utopia* is the best known and most controversial of TC&A's works, their *Semi-Living Worry Dolls* project resonates much more closely with the works I have discussed by Kira O'Reilly and Julia Reodica. For this work, they grew versions of the traditional Guatemalan worry dolls by constructing a polymer scaffolding, which was then seeded with mouse endothelial cells and

[94] Ibid.
[95] Pallab Ghosh, "Lab-grown meat is first step to artificial hamburger," *BBC*, February 19, 2012, http://www.bbc.co.uk/news/science-environment-16972761.

incubated within an "artificial womb."[96] Popular among children and tourists, traditional Guatemalan worry dolls are small figurines made of paper, black sand, and colourful pieces of string and fabric. Rustically formed, traditional worry dolls, complete with their cheerfully approximated facial expressions, possess the simplistic joyfulness of a children's toy that their semi-living counterparts distinctly lack.

Small masses of gleaming peach flesh, the *Semi-Living Worry Dolls* present their namesakes' Freudian uncanny; their similarity is all at once familiar and unsettling. While the traditional dolls serve as objects of comfort and respite, their semi-living versions seem plumbed from the depths of science-fiction nightmares.

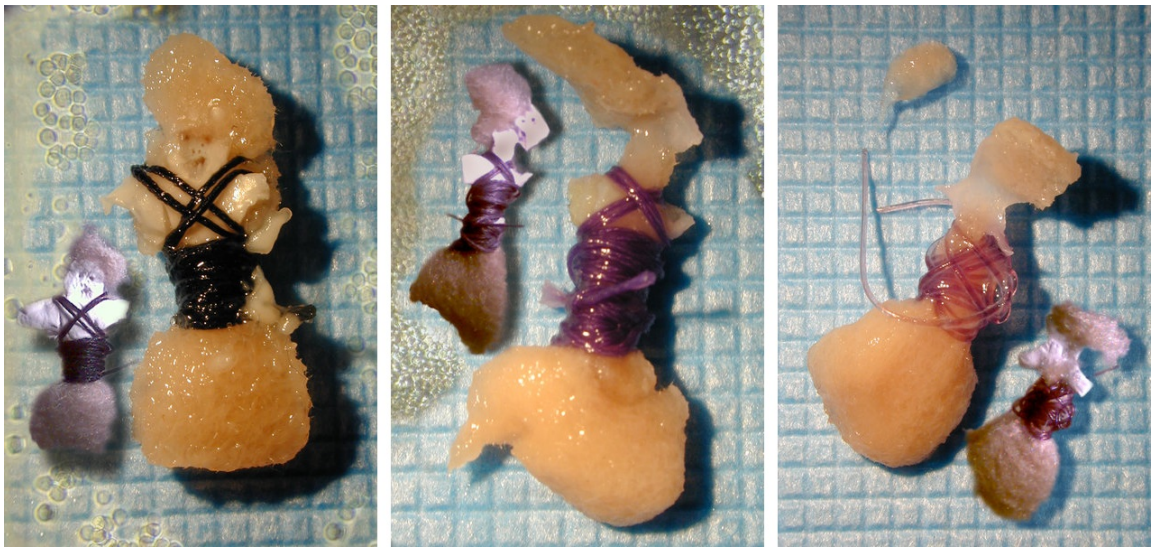

Figure 2: Tissue Culture and Art Project, *The Semi-Living Worry Dolls*, 2000. Image courtesy of the artists.

Discussing the work, TC&A include the description of worry dolls that comes included with their purchase:

[96] Oron Catts and Ionat Zurr, "Growing Semi-Living Sculptures: The Tissue Culture & Art Project," *Leonardo*, vol. 35, no. 4 (2002): 367-368.

> The Guatemalan Indians teach their children an old story. When you have worries you tell them to your dolls. At bedtime children are told to take one doll from the box for each worry & share their worry with that doll. Overnight, the doll will solve their worries. Remember, since there are only six dolls per box, you are only allowed six worries per day.[97]

Noting that they are no longer children and therefore have more worries, TC&A built seven, rather than six, dolls.[98] The dolls were allocated worries, which the duo list as:

Doll A = stands for the worry from Absolute truths, and of the people who think they hold them.
Doll B = represents the worry of Biotechnology, and the forces that drive it. (see doll C)
Doll C = stands for Capitalism, Corporations
Doll D = stands for Demagogy, and possible Destruction.
Doll E = stands for Eugenics and the people who think that they are superior enough to practice it.
Doll F = is the fear of Fear itself.
G = is not a doll as the Genes are present in all semi-living dolls.
Doll H = symbolizes our fear of Hope…[99]

The *Semi-Living Worry Dolls* revisit the same juxtaposition found in O'Reilly's *Marsyas* project: the classically domestic contrasted by the thoroughly technologic. However, TC&A's exploration of interstices between craft, capital, and science features a widely different material cut than O'Reilly and Reodica's works. In the latter, both artists emphasize using their own tissue for culturing cells and ultimately creating their projects. TC&A's dolls, however, are constructed with animal cells – not human cells. O'Reilly and Reodica establish a genealogy between themselves and their artworks that questions conventionally bounded and

[97] Catts and Zurr, "Growing Semi-Living Sculptures," 368.
[98] Ibid.
[99] Ibid.

autonomous bodies in a fashion apt for works that disturb conventional subject/object delineations. Within TC&A's project, *performance* establishes the relationship between experimenters and experiment. Through their texts discussing *Semi-Living Worry Dolls*, naming of the dolls, and auxiliary programming for their work (such as a staged dinner party to consume their *Disembodied Cuisine*), TC&A clearly define their position as creators – controllers – of their projects.

The centrality of performance in TC&A's work evokes the corporeal in another fashion – a fashion deeply embedded in histories of post-war performance art. As art historian Kristine Stiles contends:

> The body as material in [performance/action] art after 1950 was deeply tied to the need to assert the primacy of human subjects over inanimate objects, and was a response to the threatened ontological condition of life itself in the aftermath of the Holocaust and the advent of the atomic age.[100]

Through explicit occupation of a scientific position of power and descriptions of their work as "creating a new class for exploitation,"[101] TC&A clearly align themselves within this trajectory. They are not grappling with the Holocaust's legacy or the atomic age's onset, but the rise of biotechnology. New concerns require new considerations; TC&A's addition to performance art asserts primacy over the shades of grey that exist between animate and inanimate.

The hierarchy that punctuates *Semi-Living Worry Dolls* exists beyond the artists' performance and can even be found within the work's craft practice base:

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[100] Kristine Stiles, "Uncorrupted Joy: International Art Actions," in *Out of Actions: Between Performance and the Object, 1949-1979*, org. Paul Schimmel (New York: Thames and Hudson, Inc., 1998), 228.

[101] Catts and Zurr, "The ethical claims of Bioart" *AANZ Journal of Art: Art and Ethics*.

worry dolls themselves. Utilizing this item immediately links to Guatemala's tourist industry, as visitors to the country frequently take several packages of worry dolls home. Easily transported and unique, these dolls make whimsical mementos of black sand beaches and azure seas. TC&A engage with worry dolls on this level; there is little connection here to the individuals who spend their lives making them – the artists need only the dolls' form and mythology.

At their foundation, worry dolls are sympathetic magic. Operating on the basis of correspondence, sympathetic magic suggests that two seemingly separate objects can be connected and affect one another through little more than visual resemblance (e.g. voodoo dolls). While the *Semi-Living Worry Dolls* rely on visual resemblance and correspondence, their connection to the worry they are intended to alleviate – biotechnology – also produces them. They are both cause and solution; they exist only to beget their own destruction.

The project's use of worry dolls connects it to the feminine, craft-based economy of social reproduction, and the artists' description of their bioreactor as an "artificial womb" further emphasizes this relationship.[102] By describing their bioreactor as an artificial womb the artists suggest a commentary on sexual reproduction, one aspect of social reproduction that has made the most controversial transition into the area of biotechnology (in the form of new reproductive technologies [NRTs]). Indulging the work's fictive elements, the notion of a womb entirely independent of the maternal body can be traced within the

[102] Ibid.

history of science-fiction literature. Throughout these texts, the prospect of extracorporeal pregnancy has been depicted as both beneficial and disastrous. In Lois McMaster Bujold's novel, *Barrayar*, the protagonist Cordelia Vorkosigan utilizes a uterine replicator to save her unborn foetus.[103] This decision ultimately leads Cordelia to save her planet from a nefarious Count's attempted coup, and allows her to introduce enormous changes on the patriarchal planet.[104] A rare example, *Barrayar* offers a depiction of extracorporeal pregnancy that not only remains under the control of the mother, but also functions as a liberating force for her.

More frequently, the use of artificial uteri evokes totalitarian control and dystopic nightmares – an approach that *Semi-Living Worry Dolls* mirrors. Aldous Huxley's *Brave New World* offers the most famous example, depicting the universal growth of children whose abject gestation is supported with liquid hog's stomach extract.[105] TC&A's *Semi-Living Worry Dolls* project directly speaks to the troubling and problematic aspects of biotechnology, as evidenced through the list of worries assigned to each doll.

But growing organisms, whether carried in endometrium or glass, still need to be nurtured and, in their initial iteration, the *Worry Dolls* are no exception. The miniature figures were given a "supply of nutrients and other biological agents, the removal of waste and the constant maintenance of homeostasis… while keeping

[103] Lois McMaster Bujold, *Barrayar*, (New York, N.Y.: Baen Books, 1991).
[104] Ibid.
[105] Aldous Huxley, *Brave New World*, (London: Chatto & Windus, 1960).

the… bioreactor sterile."[106] This (partial) list recorded by the artists reads like parenting duties, albeit a highly clinical version. However, a later addition to the original work undoes this aspect. In 2007 TC&A created Doll G, who had been absent in the original project, for the express purpose of enacting her "slow death."[107] Within this version, Doll G represents "Genohype," a term coined by Neil Holtzman to "describe the discourse of exaggerated claims and overstatements concerning DNA and the Human Genome Project."[108]

In a statement about the work, the artists explain the macabre focus of the project as an attempt to "express… worry and growing concern regarding the persistence of the Genohype… We hope Semi-Living Doll G will sway this misconception away."[109] They never explain exactly how Doll G will undo the damage of the Genohype misconception. Beyond this purpose, the death of Doll G also attempts to focus "attention on the most obvious (but discursively neglected) aspect of living art – it is in the process of dying."[110] This reframing of the tissue culture's life into a performance of death severs any ties of motherly nurturing.

TC&A's investigation seems to share some of O'Reilly and Reodica's concerns about the absorption of social reproduction into capital, but the terms of engagement are distinctly different. Whereas O'Reilly and Reodica turn the

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[106] Catts and Zurr, "Growing Semi-Living Sculptures," 367.
[107] "Semi-Living Doll G," Tissue Culture and Art Project, accessed February 28, 2012, http://tcaproject.org/projects/worry-dolls/doll-g.
[108] Oron Catts and Ionat Zurr, "Big Pigs, Small Wings: On Genohype and Artistic Autonomy," *Culture Machine*, Vol. 7 (2005).
[109] Ibid.
[110] Ibid.

biotechnological back into the personal, TC&A maintain a performance of austere distance. Even their texts discussing the work evoke the neutral imparting of observation. In this sense, they attempt to occupy the same discursive space as the scientific figures of neutrality and authority they critique. While their artistic statements offer the most direct and vocal critique of biotechnology, their work says the least when offering a productive framework to deal with these issues.

Conclusion

Arachne's mythological tapestry exposes the rarely discussed sexual proclivities of the gods. These stories retell the rape and abuse of the powerless: Europa, Asterie, Leda, Antiope, Danaë and Aegina are just a few of the figures whose stories are included.[111] Of course, the depictions of these mythological scenes did not end with Arachne; many of these tales resurge frequently throughout the history of art. However, these later representations rarely appear transgressive, or even hint towards criticism. Danaë paintings, in particular, have offered artists opportunities to disguise erotic images beneath the flimsy yet acceptable veil of classical mythology. From Titian to Gustav Klimt little variation appears in the Danaë formula that consists of arched backs, luxurious textiles and obvious pleasure. If this extensive history of Danaë depictions avoids criticality, what enables Arachne's image to possess a level of criticality while others simply employ the tale as a means for titillation? Beyond Arachne's obvious intention to offer a critical perspective, there exists another interesting distinction between Arachne's depiction of Danaë and those of other artists: Arachne paid for her depiction with her life.

It would be extreme to suggest that artists wanting to produce critical and subversive depictions should be willing, like Arachne, to sacrifice themselves in exchange, however, giving something of one's self to the work recurs frequently. Within the work of O'Reilly and Reodica we witness the introduction of social reproduction into the realm of biotechnology, but this occurs on one specific term:

[111] Ovid, *Metamorphosis*, 193-194.

that the artists occupy the position of both subject and object. Within the laboratory they are both experimenter and experiment. This blurring of boundaries between these roles, achieved through employing biotechnology, allows for a transformation that Arachne could only provide by relinquishing her human form.

By contrast, the work of TC&A notably avoids using their personal tissues and cells to develop their *Semi-Living Worry Dolls*. Instead, their relationship to the work is established through their performance and infiltration of an authoritative position. Resultantly, their work exhibits a sense of removal that interferes with the purported criticality of the project. While the dolls are intended to question the power structures employed within biotechnology, they nevertheless operate within them. Although they are meant to complicate the boundaries between human and non-human, the work fails to transgress these distinctions.

Yet despite their differing methods and levels of criticality all of these artists, O'Reilly, Reodica and Tissue Culture and Art Project, use their work to bring forth rarely circulated stories of women. They explore the voices of Emma Laflamme or women who have undergone hymenoplasty[112] – individuals whose voices are rarely considered valuable or worth remembering. In this sense, as much as their works operate on the level of specific bodies, they address the concerns of a larger

[112] Virginia Braun, "Female Genital Cutting around the Globe: A Matter of Reproductive Justice?" in *Reproductive Justice: A Global Concern* (Santa Barbara: Praeger, 2012), 33. Because of the largely secretive and unpublicized nature of hymenoplasty/hymenorrhaphy, it is impossible to collect entirely accurate statistics on the number of women undergoing these procedures. According to Virginia Braun, "Based on *very* limited and partial date from the United Kingdom (Hospital Episode Statistic, 2009), the United States (American Society for Aesthetic Plastic Surgery, 2009, 2010), and Australia (Robotham, 2010), which put FGCS procedures per year in the thousands, and the short time span of widespread availability, it may be that less than 100, 000 women worldwide have, so far, undergone some form of FGCS. However, FGCS is often claimed to be *increasing.*"

collective. As much as these works fight against monetary and technological determinist attitudes towards biotechnological developments, they are also about another battle: a struggle against the invisibility of other factions of work. They mount a struggle for remembrance.

The refusal to forget immaterial labour's gendered precursors means that the works resist subsumption into capital. Instead, they occupy a critical space where we can realize, as Katherine Hayles states, that:

> Culture circulates through science no less than science circulates through culture. The heart that keeps this circulatory system is narrative – narratives about culture, narratives within culture, narratives about science, narratives within science.[113]

In many ways, these projects revisit the feminist aphorism, coined in Carol Hanisch's 1969 essay,[114] that the personal is political, and insert their own addendum: the non-personal is also political; it has a narrative of its own.

The entanglements of capital, gender and biotechnology are woven deeply into these works, well beyond their juxtaposition of different forms of labour and their reconfiguration of the scientific experiment. These threads are incorporated into the very duration of the work's medium. Existing for a brief, fleeting moment (if at all), the works never materialized for long. Instead, we are left with their remains: their images, writings and descriptions. If social reproduction functions as the ghost effect of production, these works of tissue culture exist as the specter of

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[113] Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999), 21-22.
[114] Carol Hanisch "The Personal is Political," in *Notes from the Second Year*, edited by Shulamith Firestone and Anne Koedt (New York: Radical Feminism, 1970).

bioart. In viewing their traces we not only witness works of tissue culture, but also come to see phantasms of Emma Laflamme and apparitions of nameless Guatemalan craft makers. Their stories haunt these works, and their labour becomes visible.

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