

## **Widok. Theories and Practices of Visual Culture**

**title:**

Posthuman Genetic Legacies: Rethinking (Im)mortality and the Limits of Reproduction Through Hybrid Bioart Practice

**author:**

Svenja Kratz

**source:**

Widok. Theories and Practices of Visual Culture 32 (2022)

**URL:**

<https://www.pismowidok.org/en/archive/2022/32-reproduction-tracks/posthuman-genetic-legacies>

**doi:**

<https://doi.org/10.36854/widok/2022.32.2512>

**publisher:**

Widok. Foundation for Visual Culture

**affiliation:**

SWPS University

University of Warsaw

**keywords:**

posthumanism; biological art; interdisciplinary creative practice; alternative reproduction; biotechnology; practice-based research

**abstract:**

The article presents Posthuman Genetic Legacies a practice-based research project that investigates avenues of producing an alternative non-human and ongoing genetic legacy via biotechnological intervention. The project aims to establish cell lines (immortalised cells) from benign tumour (fibroid) tissue removed from the artist's uterus following abdominal surgery in 2020. Rather than simply advocating for the uptake of biotechnological reproduction, the project aims to use this provocation to interrogate gender expectations and the desire for immortality via genetic continuance. It invites consideration on how a posthuman Xenofeminist positioning that disrupts biological norms and embraces the emancipatory and world-building potential of new technologies may offer an empowered conceptual space for rethinking the anguish of situational childlessness.

**Svenja Kratz** - Australian-based mixed media artist interested in transdisciplinary creative practice, particularly the intersections between science and art. Significant bodies of work include: *The Absence of Alice* – a series of mixed media exhibitions originally inspired by the artist's engagement with the Saos-2 bone cancer cell line, and *The Human Skin Experience/Equivalent Project* – a jewellery project involving tissue engineering practices. Svenja holds a PhD in Biotechnology and Contemporary Art from the Queensland University of Technology (QUT) and has exhibited her works at a range of national and international venues and events including The Science Gallery Dublin (2010), The Sydney Powerhouse Museum (2013), Experimenta Recharge (2014) and The Science Gallery London (2019). She has undertaken artist residencies at Symbiotica, Centre of Excellence in the Biological Arts at UWA (2010), the Art and Genomics Centre and Leiden University in The Netherlands (2013), and the University of Queensland (2015). Most recently, she was awarded a 2021 ANAT Synapse Grant to continue her research across visual art and cell culture. She is currently a senior lecturer in interdisciplinary creative practice within the School of Creative Arts and Media at the University of Tasmania.

## **Posthuman Genetic Legacies: Rethinking (Im)mortality and the Limits of Reproduction Through Hybrid Bioart Practice**

*Posthuman Genetic Legacies* is an interdisciplinary creative project that sits at the intersection of fine art, science and technology. The project is situated in the field of biological art (bioart) and expands on my previous work conducted in the field of cell and tissue culture and contemporary art. In this case, it is a study which takes a feminist stance with a focus on bioart as a critical and speculative tool to consider alternative conceptions of motherhood and reproduction that lie beyond established cultural traditions, which are largely predicated on the assumption of male and female coupling resulting in human progeny. In contrast, this project considers avenues of producing alternative biological offspring using biotechnologies such as cell and tissue culture. The investigation draws heavily on my personal experience as a single and childless woman in the late stages of reproductive viability coupled with recent uterine pathology including menorrhagia (heavy menstrual bleeding) and an associated large uterine fibroid (a benign tumorous growth in the uterus). In particular, the project aims to establish an immortalised cell line (augmented cells capable of continual proliferation) from fibroid tissue surgically removed via myomectomy (abdominal incision similar to a caesarean section) in October 2020. If successful, the resulting cell line would constitute my genetic progeny. Rather than simply advocate for the uptake of alternative forms of biotechnological reproduction, the project aims to use this provocation to interrogate the human need for a sense of immortality via biological continuance. The project also presents an opportunity to give voice, via artistic research, to the grief of women who experience situational childlessness, and explore how gender expectations and historical conceptions of female

reproductive anatomy and bygone pathologies, such as hysteria, continue to impact on women's experiences.

*Posthuman Genetic Legacies* is designed as a multi-stage project with three key research phases. Gendered expectations surrounding motherhood, the medicalisation of the female body, reproductive grief, and the potential for alternative offspring, as outlined above, are central to Stage 1. This stage is already complete and culminated in a large-scale solo exhibition entitled *Mourning Story: Expectations, Absences and the Potentials for Self-Persistence* (2020), shown at the Rosny Barn Gallery in Tasmania, Australia. Stage 2 involves the isolation, immortalization and classification of the fibroid cells with the intention of making the resulting cell line available for scientific and artistic research. Stage 3 will expand on outcomes to consider legal and ethical frameworks that govern access to reproductive technologies and the use of biological materials across multiple contexts (creative, clinical and commercial) including patent and intellectual property considerations.

To begin, I would like to focus on Stage 1 of the project, firstly by providing insights into the field of biological art, seminal artistic precursors, and artists who employ biotechnologies to interrogate gender and reproductive norms. What follows is a discussion of research contributions and relevant theoretical foundations, then a summary of previous creative work in the cell and tissue culture domain. The article concludes with a brief overview of subsequent stages' progress, including an argument in favor of taking the law into account in art-science research.

## Biological Art as a Critical Method

Biological art, or bioart, is an established field of artistic enquiry involving living organisms or systems, and/or scientific processes. While there are some early examples of biological artworks, such as Edward Steichen's 1936 exhibition of custom bred Delphiniums at the Museum of Modern Art,<sup>1</sup> and Alexander

Flemings microbial "germ paintings" exhibited in 1933 at the St Mary's Hospital Medical School in London<sup>2</sup>, bioart emerged as a more recognised genre in the late 1980s and 1990s.

Around that time, bioart pioneers such as Eduardo Kac and Joe Davis introduced sophisticated and newly developed scientific techniques, such as genetic engineering, into the production of living artworks<sup>3</sup>.

Over the past three decades, the field of bioart has responded to scientific developments and emerging technologies, and expanded to encompass a wide range of processes and outputs. While an engagement with living systems and/or biotechnologies is central to bioarts practice, the artistic genre is not motivated simply by the application of scientific technologies and techniques. Rather, bioart operates as a critical and interrogative tool to examine the ethical implications of new developments in the life sciences and draw attention to problematic or oppressive viewpoints underlying proposed technological trajectories<sup>4</sup>. Operating at the intersection of cell and tissue culture and contemporary art, artist duo Oron Catts and Ionat Zurr are internationally recognised due to their practice as strong advocates for the critical potential of bioart. Since the establishment of the Tissue Culture and Art Project in 1996, the artists have developed a range of 'semi-living' sculptures<sup>5</sup> using tissue engineering techniques to question utopian notions of victimless consumption via bioengineering<sup>6</sup> and to reflect on the ongoing exploitation of non-human entities and 'life itself' in the modernist spirit of progress<sup>7</sup>. Viewed from a feminist technoecological perspective, Catts and Zurr's work highlights the faltering divisions between natural/artificial, born/manufactured, animate/inanimate and what constitutes living and non-living, self and other, all the while drawing particular attention to notions of transformation and plasticity, as well as the ethical implications and care responsibilities of

working with living organisms as 'technoscientific' material<sup>8</sup>.

A number of feminist bioartists have also used the medium to critique taboos, gender inequalities and oppressive cultural practices. For example, in an effort to address associations regarding menstruation as being 'unclean' or taboo, the artist WhiteFeather Hunter explores the use of period blood as a nutrient serum for cultured cells as part of her *The Witch in the Lab Coat* and *Mooncalf* (2019 - ) projects<sup>9</sup>. In the *hymNext Project* (2004 - 2008), artist Julia Reodica used her own vaginal cells to create cultured cell sculptures with the aim of encouraging critical discussion regarding gendered expectations of sexual purity and monogamy and the contemporary practice of hymen reconstructive surgery<sup>10</sup>. Alternative conceptions of motherhood have also been explored via bioart and speculative design projects based on scientific developments. Many of these projects draw on new and emerging technologies, including assistive reproduction methods and cellular reprogramming to consider the continued systematic oppression and marginalisation of people of color, queer and non-binary individuals in a technoscientific context. The poetry/bioart project *Pregnancy* (2015) by Micha Cárdenas, for example, reflects on the experience of sperm banking from the perspective of a trans woman with the aim of "reimagining science in the interest of oppressed people"<sup>11</sup>. Similarly, the speculative design project *Impossible Baby* by Ai Hasegawa draws on developments in iPSC technology to examine the potential of same-sex partners to produce biological offspring<sup>12</sup>. By developing convincing visualisations of children based on the genetic information of a same-sex couple, alongside contemporary scientific developments, the project aimed to stimulate debate regarding bioethics including access to future reproductive technologies for individuals who do not conform to heteronormative standards<sup>13</sup>. These speculative works highlight gender and queer issues that aim to challenge mainstream views

and unconscious bias.

Speculative design and biological art works have also been used to explore alternative forms of kinship and biological connection beyond species boundaries. The speculative design work titled *I Wanna Deliver a Dolphin* (2013) by Ai Hasegawa imagines the potential of mitigating human overpopulation and overconsumption by engineering the human placenta to facilitate the gestation and birth of endangered species by surrogate humans<sup>14</sup>. The work employed a range of speculative material including fictional video work showing a woman birthing a dolphin in a swimming pool and hypothetical anatomical models. In contrast, Maja Smrekar's *ARTE\_mis* (2007) addressed a more direct biological human/non-human transgression by mapping cross-species connection. As part of this project, Smrekar's enucleated egg cell was fused with a cell isolated from her dog's saliva<sup>15</sup>. Her larger *K-9 Topology* (2014 – 2017) project also included the induction of milk secretion in the artist to facilitate the nursing of a dog pup<sup>16</sup>. While many of these projects are deliberately provocative, a key feature of many bioart works involving human/non-human interactions is their focus on the ethical implications of the propositions, highlighting moral uncertainties and care-related responsibilities linked to the creation of all living organisms, from animals to cells and microorganisms<sup>17</sup>.

## Extending the Conversation

While biological art has an established record of critical and feminist engagement, the subject of situational childlessness due to delayed childbearing or other circumstances remains a marginal field of enquiry across all domains<sup>18</sup>. Indeed, the majority of studies on childlessness have traditionally focused on infertility or voluntary childlessness<sup>19</sup>. While there are some shared experiences for most involuntarily childless individuals, including a sense of loss and grief, it is important to acknowledge

differences between infertility and circumstantial childlessness. For many women in the later stages of reproduction, childlessness is not a result of infertility, but rather the result of external circumstances, such as being unattached and unable to take on the financial burden of assisted reproduction and single parenthood. Regardless of circumstances, the desire for children and gender expectations regarding motherhood contribute to a deep sense of loss, grief and powerlessness<sup>20</sup>. Furthermore, there remains little targeted support or avenues for dialogue for single women that experience childlessness<sup>21</sup>. The situation is also often accompanied by personal and social stigma where unmarried and childless women are regarded as 'spinsters', 'left on the shelf', 'crazy cat ladies' or alternatively as 'career focused' and thus wholly responsible for their own predicament<sup>22</sup>. Childless women (particularly women who are considered successful and/or attractive) are also often regarded as childless by choice, negating these deeply felt emotions and contributing to the invisibility of their experience<sup>23</sup>. As such, situational childlessness draws attention to entrenched cultural expectations of women as wives and mothers, and highlights the fact that motherhood, for many women, remains embedded-in-identity construction, as well as an expected life course. By drawing on my own experience of situational childlessness, the project aims to develop affective creative outcomes that provide non-linguistic, or 'felt', insight into the experience and grief of situational childlessness. In proposing alternative genetic pathways, the study also considers how biotechnologies may provide a sense of agency and empowerment to deal with the situation by creating alternative offspring that form part of the individual's genetic lineage.

Since the study involves the isolation of cells from a large fibroid, the project also facilitates scrutiny of 'female diseases', the medicalisation of the female body and how the problematic

concept of 'hysteria'<sup>24</sup> as well as gender expectations continue to impact on women in a healthcare environment<sup>25</sup>. Indeed, many women find that they are not taken seriously when seeking treatment, and female prevalent diseases tend to be under-researched<sup>26</sup>. The hangover of "hysteria" has also been discussed in the context of chronic illness<sup>27</sup> and endometriosis<sup>28</sup>. However, the subject also relates to fibroids, as the symptoms associated with the condition are similar to endometriosis, and diagnosis and treatment are often delayed as many women fail to seek or receive treatment due to the 'normalisation' of severe pain associated with menstruation<sup>29</sup>.

## Theoretical Terrain

From a theoretical perspective, the study draws on established research in the field of cell and tissue culture and is influenced by the intersecting fields of new materialism and posthumanism. New materialism and posthumanism are multifaceted interdisciplinary theoretical terrains operating across the sciences, arts and humanities, that are critical of anthropocentric viewpoints that privilege human exceptionalism, focusing instead on entanglements across species, disciplinary and binary divides<sup>30</sup>. Posthumanism in particular has strong associations with biological arts practice as biotechnologies and genetic technologies complicate and recompose the boundaries between different forms of life<sup>31</sup>. Posthumanism also recognises the close coupling between humans and technologies, prompting a reconsideration of humans as separate and distinct from non-human matter<sup>32</sup>. Unlike transhumanism, posthumanism does not regard technology as a 'prosthetic' mechanism to ensure the continued dominance of the human subject, but rather embraces notions of human-animal-machine-technology hybridity to challenge notions of the fixed, ideal and unitary subject<sup>33</sup>. In rejecting dualisms - nature/culture, human/non-human, self/other - and associated hierarchical arrangements,

posthumanism also puts forwards an ethical position that advocates for greater empathy towards difference and trans-species entities<sup>34</sup>. Like practice-based research, posthumanism is also very much a 'praxis' (embodied theory) model of thought where "the ways the futures are being conceived and imagined are not disconnected from their actual enactments"<sup>35</sup>. In the context of this project, the values of posthumanism that focus on alternative futures and interconnection, including deep time matter-energy and genetic entanglements, help shift from a human-centred position of continuance to recognition that we are part of a collective legacy, and thus offers a useful conceptual space for rethinking the anguish of situational childlessness and perceived loss of genetic- and self-perpetuation.

*Posthuman Genetic Legacies* is also strongly influenced by feminist technoscience and takes a technofeminist approach, which plays close attention to the gendered operations of technology and the impact of technoscientific developments on women<sup>36</sup>. The emerging field of Xenofeminism is also pertinent as it offers an open and inclusive feminist politics founded on "radical difference" and the breakdown of gender distinctions and biological norms<sup>37</sup>. Xenofeminism advocates for an 'alien future' unfettered by the restrictive sway and investment in naturalism and stability, encouraging reflection on the world-building potential of imagination and technologies to "re-engineer the world" and empower women and other dominated groups<sup>38</sup>. As such, the conceptualisation of alternative biotechnological offspring has the capacity to provide a renewed sense of agency for childless individuals and prompts interrogation of oppressive cultural practices and expectations.

## Previous Work and Project Background

*Posthuman Genetic Legacies* builds on bioarts practices more broadly but is also strongly influenced by my own practice in

this area, particularly in relation to cell and tissue culture technologies and the creative and critical affordances of cell lines. *The Absence of Alice* (2008 – 2014) for example, developed as part of my PhD research<sup>39</sup> on art-science practice, involved active culture of Soas-2 cells to reflect on the strange ontological position of cell lines, as well as the social and cultural histories and ethical implications entwined with scientific research and practices<sup>40</sup>. I found cell lines particularly intriguing entities because many, like Saos-2 cells, are available as commercial research biomaterials, and can be procured online from a variety of biomedical companies and biomaterials distribution organisations, such as the American Type Culture Collection (ATCC). They are also described as ‘immortal’. Unlike healthy primary cells<sup>41</sup> that have an inbuilt ‘stop’ mechanism for replication known as the Hayflick limit<sup>42</sup>, cell lines are able to bypass ‘replicative senescence’<sup>43</sup> and propagate almost indefinitely (with appropriate maintenance)<sup>44</sup>. Due to this characteristic, they can outlive and, when cultured, stored and disseminated as a biomedical product, also vastly outweigh the original organism from which they were initially procured. Cell lines are frequently used in research trials because they are genetically more uniform and often have established culture conditions and catalogued characteristics. Primary cells, in contrast, not only have a shorter culture lifespan, they also vary widely across different donors making them more difficult to culture and ensure replicable results. Descriptors such as ‘immortal’ and ‘genetically uniform’ are, however, somewhat misleading as cell lines are far from stable and unchanging entities. Indeed, cell lines, like all organisms, are highly responsive to changes in culture conditions, and the long culture timeframes in which cells are grown and split into multiple culture vessels (a process called passaging) often result in phenotype and genotype changes. Indeed, over 6-months of continuous culture of Soas-2 cells, I noted significant changes in both cell

appearance and behaviour, with cells becoming increasingly spindly and slow to divide. As such, low culture cell stocks (i.e. low passage numbers) are preferred for research consistency. While the ongoing transformation of cell lines is detrimental in scientific research where variables must be tightly controlled, it opens up philosophical reflection on the notion of continually becoming and the evolutionary imperative towards difference as discussed in the work of Elizabeth Grosz<sup>45</sup>.

Cell lines are also interesting when viewed from ethical and cultural perspectives; the first cell line (HeLa), established in 1951, was derived from the cervical cancer tissue of an African American woman, Henrietta Lacks, without her awareness or permission<sup>46</sup>. As Lacks passed away from the condition, her cells were (and indeed still are) shared widely between research institutes and have gone on to play a significant role in numerous medical breakthroughs, including the development of the polio vaccine. HeLa cells remain one of the most commonly used cell lines globally with an estimated total biomass of all cultured cells at "over 50 million metric tons"<sup>47</sup>. However, the presence and wide distribution of the cells caused trauma to her surviving kin and raised important issues regarding the medical treatment of women of colour and bioethics, including informed consent and biomedical regulations frameworks<sup>48</sup>. Issues regarding the complex history of the cell line have also been featured in a range of creative works including Christine Borland's (2000 and 2004) *HeLa* exhibitions and Cynthia Versperget's *Anarchy Cell Line*.<sup>49</sup>

Unlike HeLa, the Soas-2 designation does not represent donor initials but rather references their origin as a 'sarcoma osteogenic,' or bone cancer. Personal details of the provider are not available but the ATCC catalogue entry documents that the cell line was established in the 1970s from an 11-year-old Caucasian girl<sup>50</sup>. In an effort to recontextualise and acknowledge the origins of the cell line, I named the donor Alice. As I worked closely with the cells over a six-month period between 2007 and

2008, I found that I was compelled to think about the ethical implications of all cultured cells. I wondered whether the parents of the young girl would be grateful that a part of her is alive and will live on beyond her mortal timespan, or be alarmed that her disease (as isolated cells) had proliferated so profoundly and become a staple product in the biomedical terrain<sup>51</sup>.

These reflections were translated into the development of a large series of interrelated works under the collective title *The Absence of Alice* that commented on the transformative nature of cell lines and the origins and uncanny nature of the Saos-2 as a living fragment of an absent body. Creative works developed as part of the project included the production of mixed-media works featuring video of cultured cell lines and sculptural artworks integrating fixed Saos-2 cells.



*The Absence of Alice #1: Svenja Kratz, 78 Impressions of a Single Object, 2008. Plaster. Svenja Kratz, Fragments of a Body in the Process of Becoming Other, 2008. Latex containing Saos-2 cells, Perspex, wood. QUT Visual Art Gallery.*

While cell lines are derived from, and remain genetically linked to a particular organism, they are different from their typical and healthy counterparts as they require a form of mutation or augmentation to disrupt the 'stop' signal. Therefore, many cell lines (e.g HeLa, Saos-2) are cancer cells, or alternatively cells that have been transformed via gamma irradiation, chemical exposure or the introduction of viral genes<sup>52</sup>. The HEK 293 cell

line, for example, was created from the human embryonic kidney tissue of an aborted fetus via the addition of Adenovirus 5 DNA<sup>53</sup>

. The original cell line has since been augmented via the inclusion of additional viral vectors to produce the 293T (293tsA1609neo)<sup>54</sup> and 293T/17<sup>55</sup> derivatives (among a range of other variants<sup>56</sup>). The 293T subsidiary cell lines were developed to increase the HEK 293 cell transfection rate (their ability to introduce DNA or RNA into mammalian cells), thus making them useful for further genetic mixing. Cell lines, therefore, have the potential to not only spawn daughter populations but also become vessels for ongoing transformation.

In an offshoot investigation of *The Absence of Alice* project, I worked with scientific collaborators from the art-science laboratory Symbiotica<sup>57</sup> to introduce fluorescent proteins isolated from marine invertebrates (jellyfish and coral) into HEK 293T cells to produce cells that glow red or green under particular light conditions. The resulting work, *HEK 293T: The Transformation of Johni or Oliver*, included flasks containing the cultured cells with video, taxidermy butterflies (as symbols of transformation) and sculptural elements that reflected on the potential of cell and tissue culture to develop new biomedical organisms from discarded biological material that defy traditional taxonomic classifications<sup>58</sup>.

## Delayed reproduction and the lie of a simple choice



*The Absence of Alice #6: Svenja Kratz, HEK293T: The Transformation of Johni or Oliver, 2010 – 2012. Mixed media: preserved HEK cells in cryovial, human and synthetic hair, animal bones, polymer clay sculptures, faux and organic moss, video, MDF and Perspex, The Block, QUT.*

While the project draws on my previous practice in the area of cell and tissue culture, it is also deeply personal, drawing on my growing sense of grief as I remain single and move towards menopause and my own form of ‘reproductive senescence’. Like many women, I have been made increasingly aware of my reproductive lifespan. In my late twenties, my mother started to remind me that the clock was ticking. When I was in my early thirties, she recommended that I freeze my eggs. This suggestion was no doubt well-meaning. However, it downplays the harrowing journey for women undergoing egg extraction and in-vitro fertilisation (IVF)<sup>59</sup>, and as ethics scholar Angel Petropanagos asserts, gives a misleading sense of a ‘quick fix’ that also “leaves the problems rooted in gender inequalities largely untouched”<sup>60</sup>.

For women undergoing ‘social’ or age-related egg freezing, the process carries moral judgement and is frequently regarded as

a lifestyle choice<sup>61</sup>. As Angel Petropanagos states, "It is assumed that women who freeze eggs for age-related reasons are choosing to put motherhood on hold for selfish reasons like pursuing higher education or advancing a career"<sup>62</sup>. However, in many cases delayed childbearing is not a decision, but rather the result of individual circumstances such as relationship breakdown. Early parenthood also carries very real impediments in relation to education, financial security and career building, particularly for women<sup>63</sup>. The view also implies that the technology is highly effective and accessible to all, despite a reported average 20 - 30% success rate<sup>64</sup> and non-medical reproductive technologies carrying a significant exclusionary financial burden for disadvantaged groups<sup>65</sup>. Alternatives, such as seeking a partner quickly and more indiscriminately or becoming a single parent, are also fraught with risk as they carry potential for domestic abuse and financial hardship<sup>66</sup>.

Regardless of my own privileged upbringing, as an artist and PhD student at the time of suggestion, the option of egg freezing was not a financially viable option. While I have since finished my degree and have relatively stable employment, becoming a mother, especially a single parent, still carries with it significant financial and career implications. Living alone in a location with no family and limited support from friends, also means that sole parenting is an incredibly daunting proposition. I had always assumed that 'one day' I would become a mother. However, I have now begun the difficult journey of life-goal re-evaluation. Part of this process involves rethinking notions of 'offspring' in an effort to reclaim a sense of reproductive control. With this in mind, I started charting the way in which biotechnologies, including recombinant DNA technologies and gene therapy, might afford me a mechanism of introducing my genetic material into host organisms. As part of my research

into these options, I became enthralled by the concept of the virus as a vector for transformation and genetic integration. For example, viruses are used in gene therapy as a mechanism for introducing new genes into cells<sup>67</sup>. It is also largely accepted that humans contain up to 8% viral DNA from ancestral infection and that the integration of viral information may have facilitated the transition to placental birth in mammals<sup>68</sup> – illustrating that viruses likely have had a significant role to play in the evolution of placental mammals and other organisms.

Drawing on these ideas, I developed the mixed media work *Self-Portrait #2: Site of Infection*<sup>69</sup>. The work consists of a wax cast of my bust, rendered in a style reminiscent of classical depictions of female gods, that emits vapor containing my DNA. By incorporating 'DNA breath', the work suggests viral infection as a potential mechanism of securing an ongoing genetic legacy. More specifically, I proposed that by genetically engineering viruses to include fragments of my genetic code, it may be possible to infect an organism and use the virus to reproduce the genetic material within the selected host. By using a retrovirus and targeting germ cells (e.g. sperm, eggs) the selected DNA sequences could also be passed on to the organism's offspring. In this way, I would not need to have children as other organisms (including humans) could become hosts and continue to pass on a portion of my genetic material. By being deliberately provocative, the work aims to highlight the discomfort many people experience at the prospect of infection and 'genetic contamination' despite the fact that we are constantly breathing in and integrating foreign DNA. Indeed, as Timothy Moreton asserts<sup>70</sup>, all organisms are essentially multi-species ecologies comprised of shared and swapped genetic material.

## A return to cell culture via uterine pathology



Svenja Kratz, *Self-portrait #2: Site of Infection*, 2019. Mixed media: wax, porcelain polymer clay, water vapor containing the DNA of the artist, electrical components. Plimsoll Gallery, Hobart, Tasmania. Photo: Remi Chauvin

More recently, my work has returned to cell culture and particularly the prospect of establishing an immortalised cell line from my own body via a range of processes such as using viral genes to disrupt programmed cell senescence. While, there is a processor, the *Billy Apple*® cell line established by artist Craig Hilton in 2010, the desire to produce my own cell line does not align with Hilton and Apple's ambitions for the extension of the *Apple*® brand, but rather developed as an opportunity arising from my recent experience of uterine pathology.

In 2019, I was diagnosed with a large fibroid. While common in women of later reproductive age, the diagnosis followed numerous years of symptoms including extreme pain and menorrhagia. Despite having regular check-ups with a physician and discussion with my mother, my condition was initially dismissed by both as simply 'heavy periods'. To avoid the label of the 'hysterical woman', I initially accepted this verdict. However, over time, increasing evidence suggested otherwise.

For example, in late 2018 I had a hairline fracture to the ulna (arm bone) but did not recognise that I had a broken arm because the soreness was minimal compared to my period pain. The following year I started to collect my period blood using a menstrual cup. This was instigated as part of a creative project charting the progression to menopause. Usage instructions on the cup indicated that they were able to hold larger quantities of blood and could be used successfully, without leaks, for up to 12 hours. Despite using a larger cup, the vessel was filled and leaking after 1-2 hours. When I poured liquid onto paper as part of the documentation process, large clots, the size of baby organs spilled out. Over three days I accumulated a large volume of congealed blood masses and was able to gain confirmation from my mother that this constituted more than 'heavy flow'. When I sought further guidance from my doctor, I offered to show her the photographs. She declined, but took my claims more seriously stating that I may be suffering from endometriosis or fibroids. I was subsequently scheduled for a transvaginal ultrasound. The scan revealed a large pedunculated subserosal fibroid (growing on the outer surface of the uterus) with an estimated size of approx. 10-11cm (although the actual size was closer to 15cm).

The size of the growth meant that surgery was my only option. On reviewing my age, the consulting physician initially suggested hysterectomy. However, I argued in favour of myomectomy (the removal of the fibroid via abdominal surgery) as it would preserve my fertility, even though (as the doctor commented) chances of conception were limited and, even if successful, my status as a 'geriatric mother' would carry additional risks. When I asked why fibroids arose, the physician commented offhandedly to the effect that: "the uterus wants to grow something, so when there is no baby, it simply makes its own". I am sure that the remark was not meant as a serious response, as the causes of

fibroids are still debated. However, these experiences illustrate the way in which women's health issues are often dismissed and how women over 35 are regarded in the medical field as foolish for waiting, elderly/past their prime, and in danger of: miscarriage, reduced likelihood of pregnancy, twins, birth defects, high blood pressure, gestational diabetes, difficult labor and birth complications<sup>71</sup>. Reproductive age for men remains less scrutinised despite recent studies indicating that sperm quality also diminishes with age and paternal age may also increase pregnancy risks<sup>72</sup>. Fortunately, there is an established practice of harvesting tissue for research purposes (with appropriate ethics clearance of course) and the surgeon agreed to provide fibroid tissue sections for the isolation of cells. I saw this as an opportunity to regain a sense of individual agency and rethink my 'tumour baby' as an alternative offspring.

## Preliminary Outcomes – Mourning Story: Expectations Absences and the Potentials for Self-Persistence



Svenja Kratz, *Mourning Story: Expectations, Absences and the Potentials for Self-Persistence*, 2020. Installation view, Rosny Barn Gallery.

Over the nine months leading up to the surgical removal of the fibroid tumour, I developed a body of creative works for a solo show titled *Mourning Story: Expectations, Absences and the Potentials for Self-Persistence*,

exhibited at Rosny Barn Gallery, Hobart in August 2020. The exhibition attempted to provide insight into my medical experiences and highlight problematic constructions of womanhood that reinforce traditional gender expectations including assumed motherhood.



Svenja Kratz, Anita Gowers and Phil Blacklow, *Blood Floriography*, 2020, Marquetry panels: Tasmanian timber, mother of pearl and clotted period blood with custom frames. Installation detail, Rosny Barn Gallery

One of the first works developed as part of the series consisted of four marquetry panels created in collaboration with woodcraft expert Dr Phil Blacklow and frame scholar Anita Gowers. The panel designs referenced floral motifs centered on the Victorian language of flowers in relation to Western constructions of femininity, such as 'Ivy', which symbolises marriage and fidelity<sup>73</sup>. The centre of each panel features the preserved clotted period blood, collected prior to the fibroid diagnosis, surrounded by mother of pearl. The floral motifs and craftwork are designed to be seductive, with the disguised blood hinting at the way in which women's experiences are often hidden in plain sight and dominated by cultural expectations.



Svenja Kratz, Anita Gowers and Phil Blacklow, *Blood Floriography*, 2020, Marquetry panels: Tasmanian timber, mother of pearl and clotted period blood with custom frames. 'Ivy' panel detail

*After Spring*, also developed in collaboration with Gowers and Blacklow, follows this line of engagement and references work by

the Renaissance painter Sandro Boticelli. In particular, the painting refers to *Primavera* (ca. 1477 - 1478) which celebrates Spring, a season strongly aligned to notions of fertility and youth and includes female representations that capture Western mythological constructions of an idealised femininity, which, as art historian Lilian Zirpolo attests, were designed as a lesson in appropriate behaviour for women<sup>74</sup>. In contrast, *After Spring* contains only a single figure. Taken from *The Calumny of Apelles* (ca. 1494 - 95), she represents truth and points upwards at a 3D model of a scallop alluding to Boticelli's *The Birth of Venus* (ca. 1485 - 1486).



*After-Spring, 2020*, Three panel mixed media composition: Oil on canvas, clay, polymer clay and custom frames; Anita Gowers and Phil Blacklow, *Blood Floriography, 2020*, Marquetry panels: Tasmanian timber, mother of pearl and clotted period blood with custom frames. Installation view, Rosny Barn Gallery

In this instance, the scallop is not neat and clean, ready for consumption, but shows the veins and digestive system, making a comment on notions of ideal and myth vs. wet bodily reality. The central figure is also rendered as an anatomical venus,<sup>75</sup> referencing the way in which medical imagery and knowledge is also influenced by cultural representations. The panels either side of the painting show ripples representing the way in which these cultural constructions continue to ripple through time and influence contemporary perceptions and

knowledge in both social and medical domains. The work was exhibited in conjunction with *Time is Topological*, which included a series of ticking clocks in different stages of bloom and a repurposed bleeding table.



Svenja Kratz, *Time is Topological*, 2020. Mixed media table and three clocks: Wood, faux blood, augmented medical anatomical models, plastic, polymer clay, living and faux plants, Perspex, velvet, human hair, sand, 'Ladies Handbook of Home Treatment' book, engraved MDF, repurposed clocks. Installation view, Rosny Barn Gallery

The title references Michel Serres'<sup>76</sup> concept of time as non-linear, in which past, present and future collide. While the clocks and blood make a clear reference to periods and 'reproductive countdown', the table features female reproductive organs and an illustration from a 1905 medical textbook that depicts a woman's uterus with child – a feature that is consistent with the Anatomical Venus in *After Spring* thus revealing a long-standing emphasis on women as reproductive vessels. The central feature includes a terrarium with an anatomical model with a snake in its belly surrounded by vagina dentata spiders. This element comments on the fear and desire to control female sexuality and references the legacy of hysteria and the 'wandering womb' – the belief that the uterus wanders about the body of a woman like an animal, and it is this condition

that causes major illnesses including hysteria in women<sup>77</sup>. It is a view documented in medical texts from ancient Greece, including the Hippocratic Corpus, and as Amy Koerber points out in her book *From Hysteria to Hormones*<sup>78</sup> has seen various manifestations and evolved in to the 20<sup>th</sup> century view that women's irrationality is linked to hormones.



Svenja Kratz, *Time is Topological*, 2020. Augmented anatomical model

A subtle engraving of Eve and Lilith in the Garden of Eden further reflects on the role of religious iconography and narratives in contributing to the demonising and dominance of women under patriarchal systems. Other works, such as the

*Memento Mori* series, draw on Victorian mourning rites and consist of a forest-like collection of dome works integrating my hair and symbolic elements representing death (Raven), transformation (Butterflies) and hope (Dove).



Fig 13: Svenja Kratz, *Memento Mori: Death* [Death makes souls and builds monuments - we divide and make ourselves distinct - no one wants to be forgotten], 2020, Mixed media sculpture: Taxidermy bird and beetles, bone, cubic zirconia, wood, polymer clay, polyurethane, acrylic paint, human hair, engraved glass and glass dome. Installation view, Rosny Barn Gallery.



Svenja Kratz, *Mourning Story: Expectations, Absences and the Potentials for Self-Persistence*, 2020. Installation view, Rosny Barn Gallery.



Svenja Kratz, *Memento Mori: Hope [Bodies are nests, every niche is filled with kin - we are multiple, we shed and spill - without the "infection of purity", the future remains open]*, 2020. Mixed media sculpture: Taxidermy bird, wood, polyurethane, polymer clay, human hair, acrylic paint, engraved glass and glass dome. Installation view, Rosny Barn Gallery.

The *Memento Mori* forest culminates in a life-size sculpture titled *Coming to Terms with Being Forgotten*. This work gives an insight into feelings of mourning for lost possibilities but also a recognition that, because we are already connected in a long history of genetic continuance that effectively links us to all other organisms and deep time histories, the idea of establishing a genetic legacy is actually unnecessary. Perhaps, the work suggests, our role is to acknowledge these entanglements, let go, die, and form part of a larger cycle of interconnected life, death and renewal that extends beyond the self.

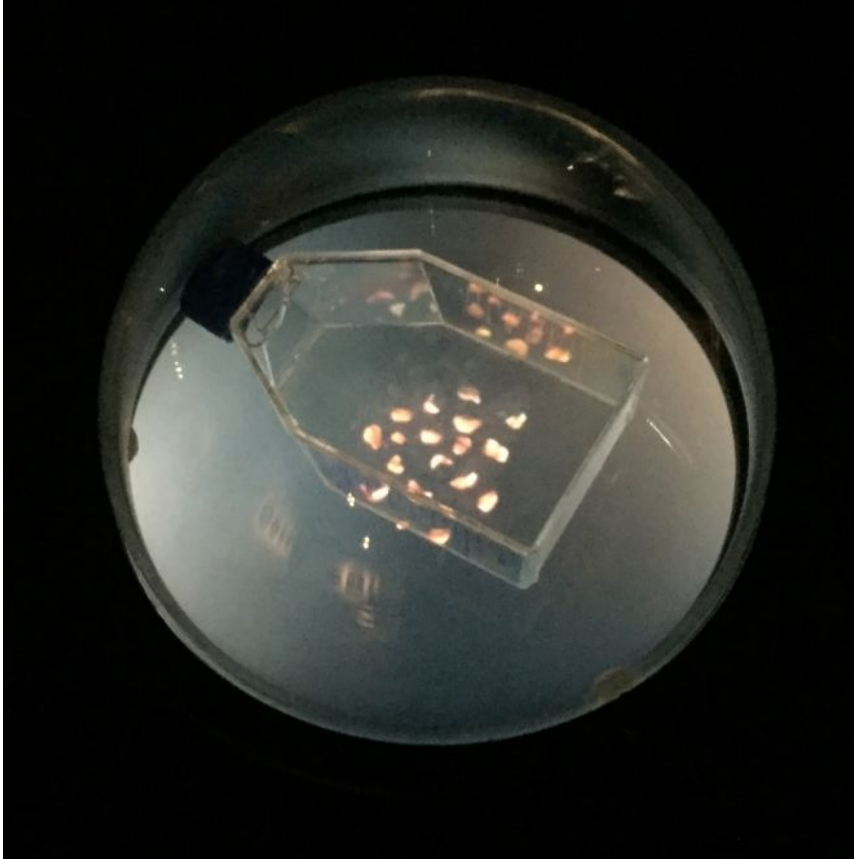
The final work in the series, *SVKR-LM: Tumour Baby*, alludes to the establishment of a cell line from the fibroid tissue. By incorporating a flask of fixed primary skin cells of mine, created as part of another project, and taxidermy butterflies, the work makes a direct reference to the previous work *HEK293T: The Transformation of Johni or Oliver*, signalling the potential for the fibroid cells to not only establish a single cell line but spawn a 'tribe' of daughter cells, like HEK 293, that could be used for both scientific and creative research endeavours, thus opening them up to new and unanticipated becomings.

## Stage 2 and Beyond

Since this body of work was shown, my fibroid has been removed and I have received ethics clearance in time for collaborators from the UTAS School of Medicine to assist with the isolation and cryopreservation (freezing) of cells from the fibroid tissue.



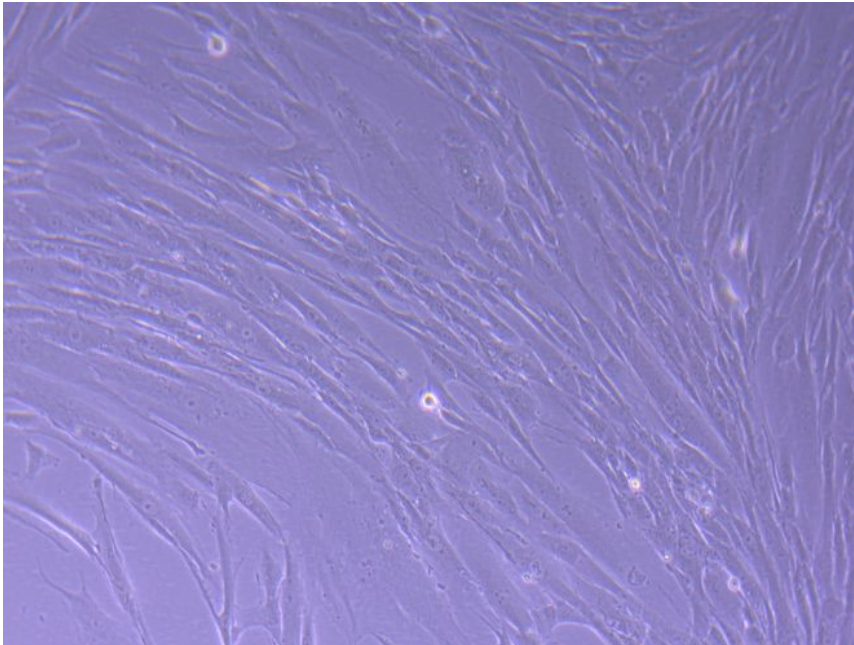
Svenja Kratz, *Coming to Terms with being Forgotten*, 2020. Mixed media sculpture: Faux and preserved flowers, faux and taxidermy insects, polyurethane, polymer clay, clay, acrylic and oil paint, wax, sand, pebbles. Installation view, Rosny Barn Gallery.



Svenja Kratz, *SVKR-LM: Tumour Baby*, 2020. Detail of video and fixed primary human cells in cell culture flask

The next stage of project development, conducted with the QUT Centre for Regenerative Medicine, UTAS School of Medicine and Centre for Law and Genetics, involves cell immortalization and genetic analysis alongside other culture techniques that will extend the use of the cells. This includes the reprogramming of the cells into a stem cell like state (using iPSC technology) to produce cells capable of becoming any other cell type. These processes will not only facilitate the establishment of a cell line (and offshoot cells) as biological progeny, but also enable a review of the procedures involved in making cells available for artistic and scientific research via biomaterials distribution companies, such as the ATCC. In this way, the project also opens up a discussion regarding the ethical implications of developing 'genetic offspring' that exist as biological products in a commercial research terrain, which as Oron Catts and Ionat Zurr observe can be seen as exploitative of the 'semi-living'<sup>79</sup>.

Furthermore, the development of a cell line and iPSCs will facilitate exploration regarding biological transformation including cross-species genetic links and differences between original host and augmented cells.



Light microscope image of cells isolated from fibroid tissue.

Drawing on expertise from the Centre of Law and Genetics, future stages will also allow us to review current policies regarding access to reproductive technologies including governance frameworks for male and female reproductive biomaterials and human-animal chimeras using bioart projects as case studies. In Stage 3, the project will also facilitate scrutiny regarding the use of biomaterials across scientific and artistic terrains, including ownership, privacy and IP implications. To date, most literature on biological art focuses on the conceptual and theoretical affordances of the practice and basic lab protocols with limited insight into legal and governance frameworks, especially where artistic, scientific, commercial and research interests intersect. By integrating legal perspectives in to bioart research, we hope to provide greater policy transparency, identify legislative gaps and identify potential approaches to governance that protect research, industry and

broader public interests, including the welfare of marginalised communities, and are responsive to different disciplinary needs and objectives. Moreover, we anticipate that the alliance of art, science and law will demonstrate the value of bringing together multi-disciplinary viewpoints towards critical present and future thinking in reproductive and biomaterials domains.

## Acknowledgements

*The Absence of Alice #1* was developed in a creative partnership between the School of Creative Practice and the Institute of Health and Biomedical Innovation (IHBI) at The Queensland University of Technology (QUT). The development of this work would not have been possible without the support of team members from The Tissue Repair and Regeneration (TRR) Program and Regenerative Medicine Program. Many thanks go to: Dr Daniel Mafe, Dr Courtney Pedersen, Dr Tony Parker, Prof. Zee Upton and Prof. Dietmar Hutmacher. I would also like to express my thanks to Michael Riddle from Creative Industries for technical assistance and conceptual input. The project *HEK293T: The Transformation of Johni or Oliver* was researched and developed at Symbiotica. Thanks are extended to Oron Catts and Ionat Zurr for their input during development phases. *Mourning Story* works were developed with support from the School of Creative Arts and Media and School of Medicine at the University of Tasmania (UTAS). Special thanks go to collaborators Anita Gowers, Dr Phil Blacklow, A/Prof. Brad Sutherland, Dr Jo-Maree Courtney and Dr Eliza Burke. Stage 2 of *Posthuman Genetic Legacies* is currently in development as part of the 2021 Australian Network of Art and Technology (ANAT) Synapse Program with A/Prof. Brad Sutherland, Dr Jo-Maree Courtney and A/Prof Jane Nielsen. The program is supported by ANAT, The School of Medicine, the Centre for Law and Genetics, the School of Creative Arts and Media at UTAS, and The Centre for Regenerative Medicine at QUT, and it is made

possible through the generous support of the Copyright Agency's Cultural Fund. *Thank you Alice and HEK293. You will be remembered always and live on in memory and the physical manifestations of your presence and absence.*

- 1 Ronald J. Gedrim, "Edward Steichen's 1936 Exhibition of Delphinium Blooms," *History of Photography* 17, no. 4 (1993): 352-363, doi: 10.1080/03087298.1993.10442317.
- 2 Eduardo Kac, "Art that Looks you in the Eye: Hybrids, Clones, Mutants, Synthetics, and Transgenics", in *Signs of Life, Bio Art and Beyond*, ed. Eduardo Kac (Cambridge MA: The MIT Press , 2007): 22 - 23
- 3 Steve Tomasula, "Genetic art and the Aesthetics of Biology", *Leonardo* 35, no. 2, (2002): 137-144, doi: 0.1162/00240940252940504.
- 4 Oron Catts and Ionat Zurr, "The Ethical Claims of Bio-Art: Killing the Other or Self-Cannibalism", *Australian and New Zealand Journal of Art* 5, no. 1, (2004):167-188.
- 5 Oron Catts and Ionat Zurr, "Semi-Living Art", in *Signs of life: Bio Art and Beyond*, ed. Eduardo Kac, (Cambridge MA: The MIT Press, 2007): 231-247.
- 6 Oron Catts and Ionat Zurr, "Disembodied livestock: The promise of a semi-living Utopia", *Parallax* 19, no. 1, (2013): 101-113.
- 7 Oron Catts and Ionat Zurr, "The Vitality of Matter and the Instrumentalization of Life", *Architectural Design* 83, no. 1, (2013): 70-75.
- 8 Marietta Radomska, "Non/living Matter, Bioscientific Imaginaries and Feminist Technoecologies of Bioart", *Australian Feminist Studies* 32, no. 94, (2017): 377-394.
- 9 Régine Debatty and WhiteFeather Hunter, "WhiteFeather Hunter, 'The Witch in the Lab Coat'", November 2, 2020, accessed July 22, 2021, <https://we-make-money-not-art.com/whitefeather-hunter-the-witch-in-the-lab-coat/>.
- 10 Aline Ferreira, "Chapter 9: Our Cells/Our Selves: Sexual Politics in Bioart", in *The Scientific Imaginary in Visual Culture*, ed. Anneke Smelik, (Göttingen: V&R Unipress GmbH, 2010): 149 - 162, doi: 10.14220/9783862347568.149.

- 11 Micha Cárdenas, "Pregnancy: Reproductive Futures in Trans of Colour Feminism," *Transgender Studies Quarterly* 3, no. 2, (2016): 56, 48-57, doi: 10.1215/23289252-3334187.
- 12 Ai Hasegawa, "(Im) possible Baby: How to Stimulate Discussions about Possibilities of Two-Mum and Two-Dad Children," PhD diss. (Massachusetts Institute of Technology, 2016), <https://dspace.mit.edu/handle/1721.1/107564>.
- 13 Ibid.
- 14 Ai Hasegawa, "I Wanna Deliver a Dolphin," in *Grow your Own... Life after Nature*, Exhibition catalogue (Dublin: Science Gallery Dublin, 2013):27-28.
- 15 Smerkar, "ARTE\_mis", <https://www.majasmrekar.org/k-9-topology-artemis>.
- 16 Eva Smrekar, "Maja Smrekar: K-9\_Topology," *Maska* 34, no. 198-199, (2019): 72-79, doi: 10.1386/maska.34.198-199.72\_1.
- 17 Joanna Zylinska, "Taking Responsibility for Life: Bioethics and Bioart", in *Ethics and the Arts*, ed. Paul Macneill, (Dordrecht: Springer, 2014): 191-200, doi: 10.1007/978-94-017-8816-8.
- 18 Emily Koert and Judith C Daniluk, "When Time Runs Out: Reconciling Permanent Childlessness after Delayed Childbearing", *Journal of Reproductive and Infant Psychology* 35, no. 4, (2017):342-352, doi: 10.1080/02646838.2017.1320363.
- 19 Ibid
- 20 See Stefanie Marsh, "The Desire to Have a Child Never Goes Away': how the involuntarily childless are forming a new movement", *The Guardian*, October 3, 2017, Accessed May 19, 2020, <https://www.theguardian.com/lifeandstyle/2017/oct/02/the-desire-to-have-a-child-never-goes-away-how-the-involuntarily-childless-are-forming-a-new-movement>; Jody Day, "Grieving for the Life Unlived", February 24, 2012, Accessed May 19 2020, *Gateway Women: United by and Beyond Childlessness*, February 24, 2012, Accessed May 19 2020, <https://gateway-women.com/grieving-for-the-life-unlived/> and Melanie Notkin, M 2012, "My Secret Grief: Over 35, Single, and Childless", *Psychology Today*, January 18, 2012, Accessed May 19 2020, <https://www.psychologytoday.com/au/blog/savvy-auntie/201201/my-secret-grief-over-35-single-and-childless>.

- 21 Day, "Grieving for the Life Unlived", <https://gateway-women.com/grieving-for-the-life-unlived/>.
- 22 Jody Day, "The Invisible Grief of the Childless-By-Circumstance Woman", *Gateway Women: United by and Beyond Childlessness*, April 4, 2017, accessed August 12 2021 <https://gateway-women.com/the-invisible-grief-of-the-childless-by-circumstance-woman/>.
- 23 Notkin, "My Secret Grief", <https://www.psychologytoday.com/au/blog/savvy-auntie/201201/my-secret-grief-over-35-single-and-childless>; and Day, "The Invisible Grief", <https://gateway-women.com/the-invisible-grief-of-the-childless-by-circumstance-woman/>.
- 24 Cecilia Tasca, Mariangela Rapetti, Mauro Giovanni Carta and Bianca Fadda, "Women and Hysteria in the History of Mental Health", *Clinical Practice and Epidemiology in Mental Health* 8, (2012):10 – 119, doi: 10.2174/1745017901208010110.
- 25 See Gabrielle Jackson, "The Female Problem: How Male Bias in Medical Trials Ruined Women's Health", *The Guardian*, November 14, 2019, accessed August 12, 2021, <https://www.theguardian.com/lifeandstyle/2019/nov/13/the-female-problem-male-bias-in-medical-trials>.
- 26 Maya Dusenbery, *Doing Harm: The Truth about how Bad Medicine and Lazy Science Leave Women Dismissed, Misdiagnosed, and Sick*, (New York: Harper Collins, 2018).
- 27 Lazslo Antônio Ávila and João Ricardo Terra, "Hysteria and its Metamorphoses", *Revista Latinoamericana de Psicopatologia Fundamental* 15, no. 1, (2012): 27-41.
- 28 Kate Young, Jane Fisher and Maggie Kirkman, "'Do Mad people get Endo or does Endo Make you Mad?': Clinicians' Discursive Constructions of Medicine and Women with Endometriosis", *Feminism & Psychology* 29, no. 3, (2019): 337-356, doi: 10.1177/0959353518815704; and Cara E Jones, 'Wandering Wombs and "Female Troubles": The Hysterical Origins, Symptoms, and Treatments of Endometriosis,' *Women's Studies* 44, no. 8, (2015):1083-1113.

- 29 Gabrielle Jackson, "Why Don't Doctors Trust Women? Because They Don't Know Much About Us", *The Guardian*, September 2, 2019, accessed August 12, 2021, <https://www.theguardian.com/books/2019/sep/02/why-dont-doctors-trust-women-because-they-dont-know-much-about-us>; and Megan Ritchey, "Uterine Fibroids: Raising Awareness for an Overlooked Disease", *Society for Women's Health Research*, July 8, 2019, accessed June 26 2020, <https://swhr.org/uterine-fibroids-raising-awareness-for-an-overlooked-disease/>.
- 30 William E. Connolly, "The 'New Materialism' and the Fragility of Things", *Millennium* 41, no.3, (2013): 399-412, doi: 10.1177/0305829813486849.
- 31 Lois Van den Hengel, "Zoography": Per/Forming Posthuman Lives", *Biography* 35, no. 1, (2012): 1-20, <https://www.jstor.org/stable/23540930>.
- 32 Pramod K. Nayar, *Posthumanism*, (Cambridge UK: Polity Press, 2014).
- 33 Ibid. See also Francesca Ferrando, *Philosophical Posthumanism*, (London: Bloomsbury Publishing, 2019).
- 34 Florence Chiew, "Posthuman ethics with Cary Wolfe and Karen Barad: Animal Compassion as Trans-Species Entanglement", *Theory, Culture & Society* 31, no. 4, (2014):51-69, doi: 10.1177/0263276413508449.
- 35 Francesca Ferrando, "Posthumanism, Transhumanism, Antihumanism, Metahumanism, and New Materialisms", *Existenz* 8, no. 2, (2013):29, <https://existenz.us/volumes/Vol.8-2Ferrando.pdf>.
- 36 Judy Wajcman, *Technofeminism*, (Cambridge UK: Polity Press, 2004).
- 37 Laboria Cuboniks, "Xenofeminism: A Politics for Alienation", accessed 26 June 2020, <https://laboriacuboniks.net/manifesto/xenofeminism-a-politics-for-alienation/>. See also Helen Hester, *Xenofeminism*, (Cambridge UK: Polity Press, 2018).
- 38 Ibid.
- 39 See Svenja J Kratz, *Artscience in Practice: Exploring the Critical and Creative Potentials of Transdisciplinary Art and Science Practice using a Methodological and Conceptual Framework of Creative Becoming*, PhD diss. (Queensland University of Technology, 2013).

- 40 Elizabeth Stephens, "Making Monsters: Bio-engineering and Visual Arts Practice", in *Corporeality and Culture*, eds, Karin Sellbert and Lena Wånggren, (London: Routledge, 2016): 71-84.
- 41 Primary cells refer to cells taken directly from the body.
- 42 See Zane Bartlett, "The Hayflick Limit", *Embryo Project Encyclopedia: Arizona State University*, November 14, 2014, Accessed August 12, 2021, <https://embryo.asu.edu/pages/hayflick-limit>.
- 43 Judith Campisi, "The Biology of Replicative Senescence", *European Journal of Cancer* 33, no.5, (1997):703-709. doi: 10.1016/S0959-8049(96)00058-5.
- 44 Matt Carter and Jennifer Shieh, "Chapter 14 - Cell Culture Techniques", in *Guide to Research Techniques in Neuroscience (Second Edition)*, eds. Matt Carter and Jennifer Shieh (Cambridge MA: Academic Press, 2015): 295-310, doi:10.1016/B978-0-12-800511-8.00014-9.
- 45 See Elizabeth Grosz, *The Nick of Time: Politics, Evolution and the Untimely*, (Durham: Duke University Press, 2004).
- 46 Rebecca Skloot, *The Immortal Life of Henrietta Lacks*, (New York: Crown, 2011).
- 47 Ibid.
- 48 Laura M Beskow, "Lessons from HeLa Cells: The Ethics and Policy of Biospecimens," *Annual Review of Genomics and Human Genetics* 17, (2016): 395-417, doi: 10.1146/annurev-genom-083115-022536.
- 49 Adele Senior, "Haunted by Henrietta: The archive, immortality and the biological arts," *Contemporary Theatre Review* 2, no. 4, (2011): 511-529, doi: 10.1080/10486801.2011.610306.
- 50 Details regarding the ethnicity and age of the Saos-2 cell line donor are outlined on the ATCC Website. See American Type Culture Collection (ATCC), "Saos-2: HTB-85™", accessed August 14, 2021, <https://www.atcc.org/products/htb-85#detailed-product-information>.
- 51 Svenja J Kratz, "*Artscience in Practice*", PhD diss. (Queensland University of Technology, 2013).

- 52 Glyn Stacey and Caroline MacDonald, "Immortalisation of Primary Cells", *Cell Culture Methods for In Vitro Toxicology* 17, no.4 – 5, (2001): 235, doi: 10.1023/a:1012525014791.
- 53 Frank L Graham et al., "Characteristics of a Human Cell Line Transformed by DNA from Human Adenovirus Type 5". *Journal of General Virology* 36, no. 1, (1977): 59-72.
- 54 American Type Culture Collection (ATCC), "HEK 293T", accessed June 26 2020, <https://www.atcc.org/products/all/crl-3216.aspx>.
- 55 American Type Culture Collection (ATCC), "HEK 293T/17", accessed June 26 2020, <https://www.atcc.org/Products/All/CRL-11268.aspx>.
- 56 See Yao-Cheng Lin et al., "Genome Dynamics of the Human Embryonic Kidney 293 Lineage in Response to Cell Biology Manipulations", *Nature Communications* 5, no. 15, (2014):1-12.; and Jun Yuan et al., "The Scattered Twelve Tribes of HEK293". *Biomedical and Pharmacology Journal* 11, no. 2, (2018): 621-623, doi: 10.13005/bpj/1414; and Magdalena Malm et al., "Evolution from Adherent to Suspension-Systems Biology of HEK293 Cell Line Development", *Nature Scientific Reports* 10, no.18996 (2020):1-15, doi: 10.1038/s41598-020-76137-8.
- 57 Established in 2000, Symbiotica is a Centre of Excellence in the Biological Arts at The University of Western Australia. See University of Western Australia, "Symbiotica", February 21, 2019, accessed August 12, 2021, <https://www.symbiotica.uwa.edu.au/>.
- 58 See Svenja Kratz, "HEK 293T: The Transformation of Johni or Oliver", in *Semipermeable+*, ed. Oron Catts, Exhibition Catalogue (Perth: Symbiotica, 2013): 28-29.
- 59 See Healthtalk, "Infertility: Difficult parts of IVF/ICSI treatment", July 2017, accessed 12 August 2021, <https://healthtalk.org/infertility/difficult-parts-of-ivficsi-treatment>.
- 60 Angel Petropanagos, "Reproductive 'Choice' and Egg Freezing", *Cancer Treatment Research* (2010): 9, doi:10.1007/978-1-4419-6518-9\_17.
- 61 Ibid. Moral judgements also extend to same-sex couples. See also Maurice Rickard, "Is it Medically Legitimate to Provide Assisted Reproductive Treatments to Fertile Lesbians and Single Women?". Research Paper 23. (Canberra: Commonwealth of Australia, 2001).
- 62 Angel Petropanagos, "Reproductive 'Choice' and Egg Freezing", 6.
- 63 See Sandra L. Hofferth, Lori Reid and Frank L. Mott. "The Effects of Early Childbearing On Schooling over Time", *Perspectives on Sexual and Reproductive Health* 33, no. 6.

- (2001): 259 – 267 and Brian McIntosh, Ronald McQuaid, Anne, Munro and Parviz Dabir-Alai, "Gender in Management", *Emerald: An International Journal* 27, no. 5, (2012): 346-364, doi:10.1108/17542411211252651.
- 64 Based on 2019 global figures (ex. China) in Bart C. Fauser, "Towards the Global Coverage of a Unified Registry of IVF Outcomes," *Reproductive Biomedicine Online* 38, no. 2, (2019):133, doi:10.1016/j.rbmo.2018.12.001.
- 65 Katie Harris, Hugh Burley, Robert McLachlan, Mark Bowman, Alan Macaldowie, Kate Taylor, Michael Chapman, and Georgina Mary Chambers, "Socio-Economic Disparities in Access to Assisted Reproductive Technologies in Australia." *Reproductive Biomedicine Online* 33, no. 5 (2016): 575-584.
- 66 Ibid.
- 67 See Medline Plus, "How Gene Therapy Works", April 12, 2021, accessed August 12, 2021, <https://medlineplus.gov/genetics/understanding/therapy/procedures/>.
- 68 Jun Sugimoto and Danny J. Schust. "Human Endogenous Retroviruses and the Placenta." *Reproductive Sciences* 16, no. 11 (2009): 1023-1033.; and David Haig, "Retroviruses and the Placenta." *Current Biology* 22, no. 15 (2012): 609-613, doi: 10.1016/j.cub.2012.06.002.
- 69 The work was developed for the 2019 show *Pandemic* curated by Dr Toby Gifford at the Plimsoll Gallery in Hobart. This exhibition coincided with the 100-year anniversary of the 1918–1919 global 'Spanish flu' influenza outbreak and has since become a strange predictor for the 2019|2020 COVID-19 pandemic. See Toby Juliff, *Pandemic*, (Hobart: Plimsoll Gallery, University of Tasmania, 2019):1-29, [https://www.utas.edu.au/\\_\\_data/assets/pdf\\_file/0008/1279790/pandemic-catalogue-online.pdf](https://www.utas.edu.au/__data/assets/pdf_file/0008/1279790/pandemic-catalogue-online.pdf); and Andrew Stephens, "From the Black Plague to HIV, artists evoke grace in face of death", *Spectrum Magazine: Sydney Morning Herald*, March 27, 2020, accessed August 12, 2021, <https://www.smh.com.au/culture/art-and-design/from-the-black-plague-to-hiv-artists-evoke-grace-in-face-of-death-20200323-p54cx1.html>.
- 70 Timothy Moreton. *The Ecological Thought*, (Cambridge MA: Harvard University Press, 2010): 34.
- 71 See Mayo Clinic, "Pregnancy After 35: Healthy Moms, Healthy Babies", July 30, 2020, accessed August 12 2021, <https://www.mayoclinic.org/healthy-lifestyle/getting-pregnant/in-depth/pregnancy/art-20045756>.
- 72 Nancy Phillips, L. Taylor, and Gloria Bachmann. "Maternal, Infant and Childhood Risks

- Associated with Advanced Paternal Age: The Need for Comprehensive Counselling for Men." *Maturitas* 125 (2019): 81-84.
- 73 Greenaway, Kate. "The Language of Flowers." (London: Routledge and Sons, 1884), <https://www.gutenberg.org/ebooks/31591>.
- 74 Lilian, Zirpolo. "Botticelli's "Primavera": A Lesson for the Bride." *Woman's Art Journal* 12, no. 2 (1991): 24-28.
- 75 The anatomical venus was based on Clemente Susini's wax model (c.1798) from the Natural History Museum collection at the University of Florence.
- 76 Michel Serres in Michel Serres with Bruno Latour, *Conversations on Science, Culture and Time*, trans. Roxanne Lapidus (Ann Arbor, MI: University of Michigan Press, 1995).
- 77 Lesley, Warner, "Hysteria." *Mental Health Practice* 11, no. 10 (2008): 22.
- 78 Amy Koerber. *From Hysteria to Hormones: A Rhetorical History*. (Pennsylvania: Penn State University Press, 2018).
- 79 Oron Catts and Ionat Zurr, "Towards a New Class of Being: The Extended Body," *Artnodes* 6, no. 2 (2006): 1-9.

