Evolution of the Subject

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Evolution of the Subject: Synthetic Biology in Fine Art Practice

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Photo: Louise Mackenzie

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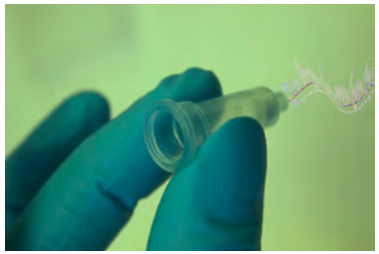

Figure 1: Louise Mackenzie (2017), *Transformation*. Participatory genetic modification workshops

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Abstract

I will discuss how art practice within a genetics laboratory can provide a situated account of scientific knowledge through a performative exploration of subjectivity. The focus of this paper is my doctoral research on my relationship with the microbial organism through its use as synthetic biology resource. Drawing source material from synthetic biology and art practices that employ biotechnology, I undertake a slow, performative practice tracing my subjective experience in the laboratory through devising a method of converting my thought into DNA and then physically inserting this DNA into the body of the common laboratory micro-organism, *Escherichia coli (E. coli)*. Diffracted through readings of post-humanist and vital materialist works, I (re)consider my intuitive engagement with the materials, methods and tools of synthetic biology both as an imposition upon the constructed space of the laboratory and upon the constructed body of the organism. Through the ongoing art project, *Pithos,* a practical engagement with the organism as vessel, and *Transformation,* a participatory performance workshop that reconsiders genetic modification as an act of assembling lively material, I construct narratives that reframe our relation to biological material through intra-action, kinship and responsibility.

Figure 2: Working in the Cloning Room at the Institute of Genetic Medicine, Newcastle. Research documentation, 2015. Image: Louise Mackenzie

Author Keywords
bioassemblage; bioart; participatory performance; vital materialism; critical post-humanism; DNA information storage; genetic modification.

Introduction

Acknowledging a rise in the use of synthetic biology[1] in art practice, I consider the liveliness of molecular biological material from a vital materialist perspective. In doing so, I reframe DNA and the micro-organism through anthropomorphic performative practice that draws on myth and metaphor to allow readings of material that account for liveliness and unpredictability rather than controlled use as resource.

The core of the research resides in artistic practice situated within the Institute of Genetic Medicine at Newcastle University, where I learn how to store a thought physically within the body of the living organism, *Escherichia coli*, closely reading scientific protocols as I explore the affect of working with laboratory life as medium. I have been privileged to work for three years with my scientific collaborators, Professor Volker Straub and Dr Ana Topf. I am welcomed by the Institute as host body and even supported by it, but I am not a part of the flow of the laboratory, my being within the institution causes a diversion of attention and resources away from the general direction that the host moves in. The effect of this diversion cannot be fully known, only read in discrete instances.

[1] Synthetic biology is a catch-all name for contemporary forms of genetic engineering, that span disciplines as diverse as biology, computing science, engineering and art practice.

The imposition of my will upon the body of the institute is a performative engagement with the laboratory that I enact on another level by imposing my thought as a physical entity on bacterial bodies inside the lab. In biotechnology, life is material; we impose our thought – our will, onto living organisms, without a second thought. I devote my practice to that second thought. I relate imposition of will to the layered uses of technology in scientific practice, acting to distance us from the materiality of life. This technological layering is evident in the trust placed in complex scientific equipment and also in the power inherent in scientific language, perhaps best illustrated in molecular biology through Francis Crick's introduction of the metaphor of belief, the *Central Dogma*, to describe the information processing logic that led to the development of the genetic code.

Thus through questioning conflated layers of meaning within scientific discourse, I attempt to develop an intimacy with material, reconsidering synthetic biology processes and translating thought into information with physical form (DNA) in order to enter into dialogue with the organism. In doing so, I come to recognize my actions as imposition upon the body of the organism and through a speculative reading of evolutionary biologist Lyn Margulis' position that 'humans are… the work of… thousands of millions of years of interaction among highly responsive microbes' (Margulis, 1998), I develop a respect for the organism that extends into the temporal and spatial: beyond the configuration of the organism as an object within the laboratory into a respect for the multiplicity of cells that exist within bodies and across time.

Figure 3: Louise Mackenzie (2013). *Dunaliella salina, Olympus CKX41 Bright Light, centred*

Alchemical Sensing

My initial engagement with the laboratory embraced biotechnology as a means to help me find a closer relation to the organism, through asking, *Can technology be used to develop an embodied experience of the organism?* Conversely, I found myself becoming further removed from it, in a sensation that I ultimately describe as alchemical.

Looking Without Seeing

In 2013, I had viewed the micro-algae, *Dunaliella salina* under the microscope (see Figure 3). I was researching cyanobacteria and other micro-algae to understand how they are used as scientific resource, leading to the exhibition and publication, *Oltramarino* (Mackenzie, 2013). I worked with scientists from Newcastle University's School of Marine Science

and Technology (MaST), where micro-algae are studied for their potential commercial uses within the health and pharmaceutical industries. I was struck by their celestial resemblance and, having discussed this with scientist colleagues, was surprised to learn that they are rarely viewed in this way[2].

This shift of context opened up possibilities in thinking about how scientific information is interpreted and whether one perspective is necessarily more accurate than another. The visual referent, constructed through the microscopic gaze, of the motile *Dunaliella salina* had the same effect as looking towards a night sky filled with twinkling stars. The movement of multitudes of organisms at this resolution was technologically sublime. Here were living organisms that I could only see aided by technology, so small that I had no direct comprehension of them (nor they of me, I imagine) and yet through the microscope I could experience them as alive.

It is universally accepted practice within science to visually examine living cells and components within living cells without the use of optics. Advances in microscopy in the past century (techniques such as confocal microscopy, spectral imaging and multiphoton imaging) have led to the use of laser technology and mathematical algorithms to compute complex reflections of light in order to create digital images of cellular structures that are instead viewed via the medium of the computer screen. This extended visual sense, which increases the distance between the eye and the observed, changes our perception of the object. We gaze through layers of technology: optical lenses, lasers, chemical dyes, computer algorithms, upon a screen at a recreated image, rather than using our eyes directly to perceive. This distance from the object through multiple layers of technology might be construed as looking without seeing. The focus becomes increasingly specific, or reduced, in attempts to identify single cells or molecules within cells, akin to the action of looking or 'directing one's gaze in a specified direction', as opposed to the arguably more holistic perspective of seeing, 'to perceive with the eyes'[3] when we engage all aspects of our visual capacities: scanning, peripheral vision, and so forth.

Of course, the distinction is not quite so clear cut, as science uses technology in order to comprehend, but the focus of comprehension is so specific and the field of vision so narrow (at times limited to individual particles within cells, seen via the reflection of specific wavelengths of light) that what is perceived is necessarily reductive. Thus the breadth of visual comprehension is limited to discrete, atomic perception (which I suggest falls under the definition of 'looking'), rather than perception across a visual plane (which I suggest falls under the definition of 'seeing').

[2] For my collaborators at the time, Dr Gary Caldwell and Dr Chelsea Brain, of MaST, Newcastle University, UK, visual information is generally taken at a higher resolution, or from more powerful microscopes that transfer data reflected from lasers directly to computer screens. Interest tends to be focused on the genetic structure of the organism itself and the mechanics of the cell.

[3] Definitions of 'looking' and 'seeing' from Oxford English Dictionary (Stevenson (ed.) & Waite (ed.), 2011)

Figure 4: Louise Mackenzie (2015). *The Stars Beneath Our Feet*, Lumiere, Durham.

Listening Without Hearing

I had been drawn to the movement of micro-algae under the microscope, thus the possibility of perceiving movement in multiple ways felt important in extending my relation towards the organism. Philosopher and sound theorist, Don Idhe describes the static object (in his example, paper clips), being interrupted by the passage of a fly that gives rise to a second level of objects characterised by movement (Idhe, 2012). Idhe counters the visual argument that the moving fly sits against a backdrop of stability with an aural perspective of the mute object sat against a backdrop of silence,

interrupted by the buzzing of the fly. In the combination of sound and vision therefore, the fly is defined through process and not a fixed notion of matter. The liveliness of the organism becomes apparent. Artist, Marta De Menezes suggests that it is this quality of motion that appeals to many artists, '[v]ery simply movement stands for life while stasis means death' (High *et al.*, 2017, pp. 53). Thus in my attempts to relate to forms of life that cannot be seen, sound plays a significant role in encountering liveliness.

For the audio-visual installation, *The Stars Beneath Our Feet* (commissioned for Lumiere Durham, 2015), I wanted to generate a sense of being with the organism. I collaborated with Dr Richard Thompson of Durham University to study the motion of *Dunaliella salina* using an Atomic Force Microscope (AFM) and researched means by which to translate the data that we received from the AFM into sound[4]. As with the visual sense, the extended perception afforded via technology broadens the possibilities for interpretation such that we are no longer hearing conventionally and must resort to what becomes a technologically embodied sense. The data gathered from the phenomenon observed using the AFM is already a number of levels removed from sound as perceived by the human ear. The depiction of the data as sound necessitates further technological layering, referred to in sound theory as sonification (a mapping of sounds to data) or audification (the amplification of a data wave form)[5]. I wanted to generate sound in as direct a manner as possible. This led to a trialling of various techniques in collaboration with Dr Paul Vickers of Northumbria University, which led ultimately to the production of sound that represented deflections in the laser beam caused by the organisms as they moved. Thus I concluded that although I could reduce the layers, I still could not escape technological mediation.

[4] The AFM works by detecting deflections in a laser beam directed at a surface. It is more commonly used for force measurement and imaging of materials. By flowing liquid medium containing the *Dunaliella salina* into the chamber directly under the line of the laser, it is possible to detect the *Dunaliella's* movement as fluctuations in the scattered laser beam.

[5] Audification has been used to change the pitch of a signal usually inaudible to human ears, such as the call of a bat, and to speed up the vibrations of an earthquake to allow the human ear to detect particular rises and falls, for example. Sonification is a means of generating sound from data in order to convey information regarding that data. The crucial difference between sonification and audification is that sonification imposes a mapping on the data. That is, different sounds are chosen to correspond to specific forms of data, and any form of sound could in theory be used.

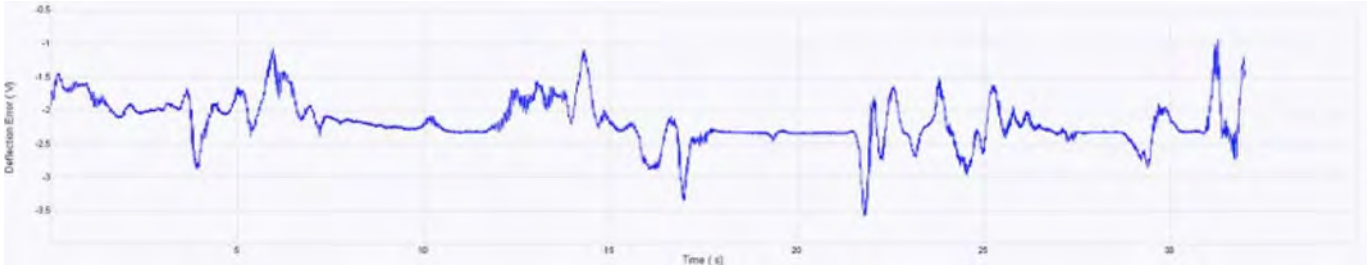

Figure 5: AFM Readings with *Dunaliella salina* (32 seconds). Research documentation, 2015. Image: Louise Mackenzie.

The distinction made in sound research between sonification and audification prompts a similar consideration with visual technology. How might we interpret an image that is only readable through the light emitted by fluorescent dyes inserted within the observed object? Further, how do we contrast the translation of an image generated through the reflection of this light with one generated through the diffraction of this light? Just as there are multiple ways in which we translate sounds from data, '[e]very image embodies a way of seeing' (Berger, 2008, p. 10). Thus in simultaneously extending and narrowing our perception through a technological reading, our attempts to locate referents in the image or the sound are simultaneously extended and narrowed.

Looking without seeing and listening without hearing then can be seen as narrowed forms of technologically embodied perception. Technology becomes prosthesis (D Haraway, 1991, p. 195; Ihde, 2007, p. 248), enabling the brain to interpret information in new ways. I describe this as an alchemical sense, adding to our means of reading the world and at the same time further distancing us from the thing-in-itself. Attempts to reveal the object, through increasingly complex layers of technology I consider to be alchemical in reference to the ancient Greek and Egyptian origins of the tradition. Not alchemical in the sense of seeking immortality or turning metal into gold (although this fits with some of the aims and claims for the field of synthetic biology), but alchemical in the *anima mundi* sense of seeking out the essence of matter. Alchemical sensing therefore raises the question of what we understand to be out there in the world as defined through scientific technologies.

As Bruno Latour points out, the separation of nature/culture allows the endurance of 17th century alchemist Robert Boyle's argument that 'we know the nature of facts because we have developed them in circumstances that are under our complete control' (Latour, 1993, p. 18). Whilst it is possible to produce precise data from things using the laws of computing science, physics and mathematics, to lay publics this information is generated through so many layers of technology that it must be translated via scientific authority. Belief in such interpretations, therefore, is reminiscent of practices more closely aligned with alchemy, a magical or spiritual sense of perception, the kind that requires a level of faith.

Technological Layering

Feminist science theorist, Karen Barad brings to our attention Niels Bohr's definition of apparatus as matter that materialises in its relating to other matter (Barad, 2007, pp. 132–185). This agential realist view positions the human as one actor amongst many in the observation of a phenomenon. I experience this materializing of matter as technological layering, derived through the multiple choices made in using apparatus that reduce the phenomenon to a technologically layered instance. Thus the meaning that we bestow upon matter via apparatus is simply meaning in a moment, according to the particular configurations of the apparatus that we have chosen to make.

Latour states that: '[w]e can see more [in the lab], since we have before our eyes not only the image but what the image is made of… on the other hand we see less… because each of these elements… could be modified so as to produce a different visual outcome' (Latour, 1987, p. 66). Latour suggests looking without seeing through the building of technological layers to point at a specific outcome. By adding layer upon layer of technology, we develop a multi-faceted use of scientific apparatus: the adjustment of a lens or light level on a microscope, the colour of dye, the reflection or diffraction of the laser used in conjunction with the object of interest, the augmentation of hue on the resulting computer image, all constructed to convey a narrative that is simply one of many possible interpretations.

Once this technological layering is understood as a means to derive many possible interpretations, the ways in which we can relate to matter opens up. Art practice that engages with biotechnology is uniquely placed to explore alternative perceptions that extend the focused viewpoint. Technological layering can be diverted tangentially, or interrupted horizontally, opening up the possibility for interpretation that includes novel views, soundscapes or other forms of sensation, as a means to alchemically augment perception. A sense not grounded in faithful allegiance to scientific dogma but in an understanding that what we perceive is guided not only by technical apparatus but also by our own actions in using it.

Re-Reading Genetic Material

Genetic material is similarly read through layers, not of technology, but of language. In addressing my relationship to the organism as synthetic biology tool I had committed to reductive processes and the genetic modification of life, specifically that of the synthetic biology workhorse, *E. coli* bacteria. In so doing, I planned to create a means by which I could reveal the liveliness inherent in genetic material. Thus I chose to create a cypher (based on elements of the genetic code) as a means to translate the liveliness that I hoped to find, and to use this cypher as a means to share information (a subjective idea) as material substance (DNA) within the body of an organism. Thus storing a thought from my mind within the organism.

The genetic code is often referred to as 'the language of life' (see for example, Collins, 2007, 2010). It is described as a cypher that enables DNA to be read as a set of instructions. This coding metaphor, arguably derived from the work of Francis Crick and James Watson leads to a denotative semiotic understanding of biology, in which DNA becomes privileged as the

minimal functional units or figurae (Hjelmslev, 1961, p. 41) in an articulated system of meaning.

In synthetic biology, the genetic code becomes *langue*: a system of language. There is a race to develop a universal biological coding language, with a standard syntax and grammar, to aid the design and build of novel biological organisms (see for example (Myers et al., 2015). Both psychologist, Steven Pinker and artist and philosopher, Manuel DeLanda have argued that the institutionalisation of language acts to stultify (DeLanda, 2011a; Pinker, 2005). The structuring and codifying of information via semantics, syntax and grammar maps the territory (Korzybski, 1958, p. xvii). This act however, like Borges' map (Borges, 2004) defers the real, rather than dynamically interacting in the landscape.

Artists, Oron Catts and Ionat Zurr provide a gendered critique of the scientific focus on DNA, '[w]hen one reduces life to the code or abstracts the complexity into its chemical components, the visceral sentient life is being pushed farther away.' (Catts & Zurr, 2008). I experienced this remoteness from the messy complexity of life in attempting to translate the genetic code. Precedents for translating the genetic code into other forms of information range in semiotic complexity from more direct, denotative readings (Ailenberg & Rotstein, 2009; Bök, 2015; Davis, 1996) to complex connotative readings (Kac, 2009; Kac, 1999), all adding distance to the direct relationship between DNA and its material context. In working with translation, I initially attempted to find ways to sympathetically represent aspects of the genetic code (a particular codon that might relate to a specific musical chord for example) but ultimately realized that any symbol I chose was simply that: my choice, declarative and dissociated from the context of the organism.

I therefore draw from Fluxus, Dada and those who take a more expansive reading of life processes, allowing for chance and doubt in ways that the overarching doctrine of the Central Dogma cannot. I suggest that the aleatory approach to language systems employed by writers such as William Burroughs and composers such as Alvin Lucier can offer another reading of the genetic code, not as *langue* but as *parole*: the unpredictable, individual conversations spoken by the body on a day-to-day basis. Thus where Catts and Zurr focus on the privileging of DNA over the milieu of the cell, I shift focus slightly to communication and the privileging of declarative meaning over discourse.

What Will Happen If I Store This Thought Safe Within You?

Alvin Lucier's performance, *I am sitting in a room* (Lucier, 2014) became a key influence in choosing the medium through which I would translate the genetic code. In an attempt to smooth out irregularities in his voice, Lucier recorded and re-recorded a phrase, ultimately eliminating language and replacing it with noise. Along with Alvin Lucier, composer, Robert Ashley's *Automatic Writing* (Ashley, 1979) led me to think about unconscious speech acts as a means to create prose that could act as the basis for attempted dialogue with the organism. Through speech I could communicate a thought as DNA and allow this to be genetically recorded and re-recorded within the lively material of the cell. Thus I devised a cypher whereby genetic codons represent phonetic speech sounds and then I assembled the phrase, *'What will happen if I store this thought safe within you?'* as

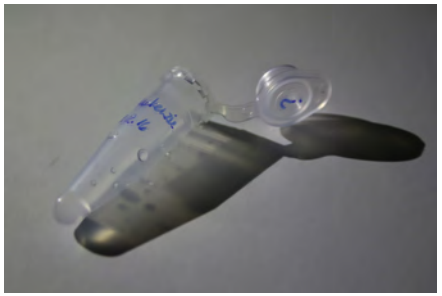

Figure 6: Louise Mackenzie (2016). *BioAssemblage #1*. A thought translated and assembled in synthetic plasmid DNA.

synthetic DNA, to be placed within the body of a living organism. I was engaging in an exchange of information, imposing my thought (my will) as DNA upon the body of the organism and then waiting for the host's response.

Assembling Lively Material

I have come to describe the matter that I have worked with in the laboratory as lively material. I define the term *lively material* in reference to political theorist and philosopher, Jane Bennett's 'vital materiality' or 'vibrant matter' (Bennett, 2010, p. 117). Lively material includes the molecular biological material that is inherently vital to the processes of life but that does not fall under any commonly accepted definition of life. I derive this term from my experiences embedded in the laboratory, where DNA and other molecular components are not considered as life, yet when contained within the body of an organism, they act within the body and are thus lively. DNA although inert, has what philosopher Manuel DeLanda describes as capacity (DeLanda, 2011b); that is, there is a capacity to act, and this capacity is always in relation to something. In the case of DNA there exists a capacity to generate and express within a living body. Thus I argue that DNA (and by extension plasmids[6], viruses and other forms of DNA considered inactive without a host body) is lively material, and in holding a capacity to act, DNA demonstrates an agency that is articulated through its relations within the body of the organism.

In translating my thought into DNA, this became *BioAssemblage #1*: lively material that I designed and then ordered to be assembled on the genetic production line as synthetic plasmid DNA that contains my thought. I then inserted this plasmid within laboratory strain *E. coli* which I now grow and maintain in the laboratory. I refer to both the plasmid and the *E. coli* as forms of bioassemblage, which I define as a culturally specific form of lively material. Bioassemblage describes the assembled biological object in the context of biotechnology. It may be a plasmid, virus or genetically modified organism. It is a constructed object that comprises lively materials assembled as component parts. It is therefore a naturecultural object. The term assemblage deliberately combines the engineering metaphor with an art historical use of assemblage and also the Deleuzian/Guattarian machinic concept of assemblage (Nail, 2017) thus describing a multiplicity of parts that act together but can equally be replaced or substituted for other parts. Added to this is the prefix -bio thus denoting that the machinic assemblage is lively and therefore unpredictable. The bioassemblage thus pays homage to Donna Haraway's cyborg, 'a condensed image of both imagination and materiality' (D Haraway, 1991, pp. 149–181). It alludes to humanity's use of DNA as tool and specifically to the information-processing model of the genetic code. The bioassemblage contains material that can be read by the biological cell or by the human mind but the meaning derived therein can never be fully comprehended by either.

[6] A plasmid is a small, circular loop of DNA, commonly found within bacteria and regularly used in genetic modification to transfer DNA to a host organism.

Figure 7: Genome Foundry, Edinburgh University. Research documentation, 2016. Image: Louise Mackenzie

Anthropomorphism as Methodology

As I worked I kept a laboratory diary. Although initially subconscious, I became aware of presenting particular aspects of myself whilst in the space of the laboratory, as a reaction to the language and protocols that I had learned. I was reframing activities in a context that allowed me to think about the organisms in their environment, rather than their chosen use as tools. I anthropomorphised the organisms, discussing them as beings, considering sentience; I spoke about the sense of responsibility I felt having generated them in the laboratory. I began to see my work in the laboratory as a form of personal, situated performance: a recalibration of scientific laboratory protocols into another, equally valid working method. I found that I was adopting anthropomorphic behavior in the laboratory that followed a language of nurture.

My first experiment in sharing my research was the collaborative project *Untourage*, a short documentary film tour of my lab work for the other scientists at the Institute. In the discussions that followed, my mutation of scientific protocol into a language of nurture led to dialogue with scientist colleagues around life rather than use. Deliberately anthropomorphising led one of the tour participants to counter my romantic description of nurture with one of torture. Further, participants began to reflect on their own use of laboratory life, extrapolating to higher order organisms that they have worked with. This begins to raise questions around the ethics of living material in the laboratory and whether it is necessary or appropriate to anthropomorphise non-sentient life. In her writing on dog training in *The Companion Species Manifesto*, Donna Haraway extols the virtues of anthropomorphism, '[a]ll that philosophically suspect language is necessary to keep the humans alert to the fact that somebody is at home in the animals that they work with' (D. J. Haraway, 2003, p. 50). It may seem less obvious how this could relate to lively material in the laboratory, but perhaps our perception of sentience clouds the significance of the act.

What became significant in publically humanizing the organism was that a change in language resulted through the group. Perhaps more important was the level of reflection that the change in language prompted. Thus shifting persona enabled not only myself but also others to think about life rather than use in the context of their own relationships in the laboratory. As Haraway goes on to say, 'just *who* is at home must be permanently in question' ((D. J. Haraway, 2003, p. 50). The importance of anthropomorphism is the absence of fully knowing the other and the value of what emerges from relating to lively material in this way.

Figure 8: Louise Mackenzie (2016), *Pithos*. BALTIC39, Newcastle, UK. 8-channel audio (3:09), clay vessel, DNA plasmid bioassemblage.

Evolution of the Subject

Anthropomorphism allows us to consider the organism in new terms, not as named resource but as co-actor in an ongoing series of processes. The question of the animal is problematized by the discovery of microbial life and what we understand in more recent chronological history as the sentience of the organism, its ability to communicate socially (Bassler, 2009) and its ability to impact us directly and have a relationship on and within us (O'Neill (Chair), 2015)[7]. With evolution there is a temporal, linear continuum, where the microbial organism is perceived to be at one end and human is at the other, yet there is also, let's say a spatial-relational spectrum, where we co-exist, indeed on and within one another at multiple points in space and time. A linear continuum enables us to ethically dissociate from the organism as other whereas a spatial-relational perspective binds us together. Within this latter collapsing of time and space then, if we are to, as Ursula LeGuin suggested, cast off the names (Le Guin, 1985), how can we adequately account for our specific relationship with the organism? What of our fear, for example, that the organism can hurt us? Donna Haraway reminds us that 'To regard a dog as a furry child, even metaphorically, demeans dogs and children – and sets up children to be bitten and dogs to be killed' (D. J. Haraway, 2003, p. 37). Just as with animals, an organism has the capacity to kill or be killed, so how then do we frame our relationship towards the organism? Can it include hospitality? The references in the literature are to Rousseau's cat, Haraway's dog, Derrida's cat (Derrida & Wills, 2002; Donna Haraway, 2000; Oliver, 2009, p. 64), these are pets, domesticated animals; animals that the author can relate to. Is it even possible to conceive of hospitality towards (shared with) an organism that runs wild among us?

I began to make what I describe as *Works of Kinship* as a means to consider my response to being with the organism in the laboratory. This began with *Memento Perimortem* (Mackenzie, 2015), an ongoing series of portraits of bioassemblages taken in the moment prior to the 'killing ritual' (see Catts & Zurr, 2003) that is necessary to ensure that the continually growing organisms do not take over the laboratory space. I then developed the project, *Pithos* (Mackenzie, 2016), which traces biotechnology to the roots of craft (techne), questions gendered scientific language and attempts to unbind biotechnology from determinism through the evolution of lively material. The first iteration of *Pithos* was the presentation of a clay vessel into which I had worked my synthetic DNA plasmid by hand, thus impregnating both the clay and my hands with the DNA plasmid. As an installation, *Pithos* focused the audience's attention on two key elements presented in a blacked out space: the simple hand crafted clay pot and an 8-channel audio work. The vessel represented the *E. coli* that I had inserted my DNA plasmid within, but was unable to bring into public space at this early juncture in my research. The audio played 8 predicted generations of the spoken phrase that I had stored within my bioassemblages, mutated using an evolution algorithm (Jukes & Cantor, 1969).

[7] The capacity of lively material to act has a quality of relation between the organism and the environment, and also between the organism and other organisms, as identified in Bonnie Bassler's research on quorum sensing (Bassler, 2009). This capacity to act is also implied in the current crisis of antibiotic resistance, where through increased interaction with antibiotics, organisms develop a slow and gradual resistance (O'Neill (Chair), 2015).

Figure 9: Louise Mackenzie (2017) *Pithos II*. Transformation Workshop, ASCUS Lab, Edinburgh.
Image: Anaïs Moisy

Figure 10: Louise Mackenzie (2017) *Pithos II*. Transformation Workshop, ASCUS Lab, Edinburgh.
Image: Louise Mackenzie

In *Pithos*, I reconsider the concept of the vessel through the myth of Pandora. In Hesiod's poem, Pandora is techné; a *pithos,* fashioned by Hephaestus from earth and water. Classicist Jane Ellen Harrison however traces Pandora to earlier manifestations as a goddess of matriarchal ritual (Harrison, 1991, pp. 257–321). Thus *pithos* is framed as both crafted and lively. Synthetic biology depicts the living organism as chassis, conjuring images of Fordian production lines and eliciting similar physical manifestations in genetics (see Figure 7). Both chassis and vessel suggest forms of containment, but the former indicates a determinate structure, constructed and controlled and the latter evokes unpredictability, a space for gathering and nourishment, fluid mixing and also spilling out. By evoking Pandora, I hoped not to lose sight of the lively origins of the assembled organism.
The second iteration of *Pithos* brought the bioassemblages to a public space during the *Transformation* workshop series (Mackenzie, 2017b), where we planned to grow and maintain the organisms within a public laboratory for the duration of the exhibition. Serendipitously, life had other ideas. The vessel cracked with the heat of the nutrient agar and microbial matter in the air settled in the vessel, enabling multi-cultural colonies to flourish alongside bioassemblages.

The group exhibition, *#FEED* at Queens Hall Arts Centre in Hexham (Smith, 2017) was an opportunity for me to further develop *Pithos* and bring the genetically modified *E. coli* into an exhibition context for the first time. In this installation, under the title, *Food for Thought,* I presented sterilized bioassemblages in a clear glass vessel, along with the correspondence from myself to the GMO Health & Safety officer at Newcastle University, which confirmed that the organisms would be both sterile (their lives terminated) and contained safely (no leaking or spilling out). This work was presented alongside a single printed image of all the *E. coli* bioassemblages that had died in the making of this particular work, *Memento Perimortem 2016-17* (Mackenzie, 2017a).

Relating to the Microbial

Following the making of *Untourage*, I had been looking for ways to increase audience engagement with my activities in the laboratory. With my scientific collaborator, Dr Ana Topf, I developed *Transformation* (Mackenzie, 2017b), which I have come to describe as a psychotransgenic workshop. I arrived at the term *psychotransgenics* latterly as a means to describe the activities that unfold during the workshops. *Psychotransgenics* borrows from psychogeography (Debord, 1956) a sense of slowing down to observe personal responses to a situation. It takes into account not only the physical act of generating a transgenic organism, but the performative affect of doing so: a thinking through making. The use of the term also references a psychological approach to relating to the organism through metaphor and anthropomorphism, which I trace back to alchemical ideas of a world soul that align with vital materialist readings of matter (Bennett, 2010, pp. 116–120). Through experimental approaches to assembling DNA and a slow, anthropomorphic reading of the organisms that are modified to hold this DNA, psychotransgenics attempts to broaden the tasks undertaken as mundane laboratory practice into a richer, more troubling enquiry on the multi-relational affect of using lively material as resource.

Figure 11: Louise Mackenzie (2017), *BioAssemblages for Sterilisation*. Detail from *Food for Thought*, #FEED, Queen's Hall Arts Centre, Hexham.

These *Works of Kinship* position the subject as spatio-relational lively material and raise questions regarding humanity's inability to '"cut" once and for all where we would in general like to cut' (Derrida, 1988, p. 285) in defining our relation to the other. In offering unconditional hospitality to the organism, akin to what philosopher Leonard Lawlor describes as 'giving the animal all of one's home and oneself' (in High et al., 2017, p. 173)), we open up questions of sacrifice in considering whether it is possible to unconditionally share with the microbial other, whilst at the same time, realising that in the case of the organism, the home that we share is also the home of the self and the other is never completely separate.

Philosopher, Jacques Derrida attempts to navigate a path through humanity's troubling relationship with the animal other, in his suggestion of, '*learning* and *giving* to eat, learning-to-give-the-other-to-eat' (Derrida, 1988, p. 282), yet his words remain entangled in constructed spaces, caught between the wild and domesticity. If we accept that this boundary is constructed, to eat well is not only about sharing but also about understanding that, to an extent, we are eating ourselves. Philosopher Emmanuel Levinas claims that the animal does not have a face, and in my extension of animal to organism, I must agree, for not every animal does. Levinas references the snake, which arguably is not the most obvious example. I choose microbe (or even mole rat, for let's face it, the face is all about the eyes). The face (that Levinas denies the animal) Derrida sees as a means to form a relationship with the other, an obligatory relationship where one is held hostage before the other, this face is domestic. There is no face when domesticity is stripped away and we are all wild, when the animal (the organism) is always already a part of the other. This aligns with the 'sacrificial structure' at the heart of Derrida's argument that Levinas cannot address through the face, but diffractively suggests a new form of sacrifice, not Derrida's *carnophallogocentrism* but *autophagy*. We must be prepared to sacrifice parts of ourselves as we sacrifice the other. This is where unconditional hospitality arises, through sacrificing *the* organism in accepting that we are always already *with* organism and (perhaps most importantly) we *are* organism.

In *Transformation*, I develop my position on autophagy by altering from anthropomorphizing the organism to xenomorphising the collective body of cells, always in-it-together (Braidotti, 2005), never in isolation. Xenomorphism translates as strange form (from the Greek *xenos*- strange, and *–morph* form). Thus in the relational context of matter as 'a dynamic intra-active becoming that never sits still' (Barad, 2007, p. 170) and within that context, lively material that relates to willful impositions upon it through bioart and synthetic biology practices, I consider the collective body of cells that comprise any living organism, including the human body, as an always stranger stranger (to mutate Timothy Morton (Morton, 2010, p. 15)): a xenomorph comprised of elements that we cannot possibly fully know. After participants have constructed their own bioassemblages, they are invited to the *Zone of Inhibition* to be interviewed/interrogated by the xenomorphic *Cells of L'Avenir*, a community-being of cells that wish to communicate with their human kin. Emulating the glare of laboratory conditions, participants are literally placed under the spotlight and their responses recorded for later analysis (video playback), thus including the wider living community in their subjective experience of genetic modification.

Figure 12: Louise Mackenzie (2017), *Zone of Inhibition* at *Transformation workshop*, ASCUS Lab, Edinburgh. Image: Gary Malkin

In using the term xenomorph, I appropriate Derrida's, 'animal that therefore I am' (Derrida & Wills, 2002) but draw from xenofeminist practice that embraces the alien (Bureau d'etudes, Chardronnet, Tsang, & Petric, 2017; Cuboniks, 2015) and vital materialist approaches that extend the sense of self beyond the body (Bennett, 2010, pp. 116–119; Braidotti, 2005). I replace animal - that which has a face that we can relate to - with the alien other/self of the organism (the cellular body) that we already are but can never fully understand. By treating the objects of my enquiry as collectively complex forms, with a nonhuman form of sentience, my intention therefore is not to humanise but to problematize matter, suggesting that we must acknowledge we can never fully understand its rich spatial and temporal depth, facets of it will always be alien to us. In this context, I contribute to the discourse of xeno-politics as a rejection of the natural by extending towards it the beginnings of an aesthetics of care: that is, an acknowledgment of acts of imposition, within the context of synthetic biology, as acts of autophagy.

Imposition implies an exchange. It suggests taking up space and it suggests drive and force. Implicit in the actions of the self, willfully acting upon the lively material that we are at once a part of and can never fully know is a requirement to acknowledge the act of imposition. If I impose, I impose upon my extended self and as such, I become responsible for my actions. Human will therefore manifests as autophagic imposition.

Conclusion

Returning to alchemical sensing therefore, my sense is that we are not seeking, as the ancient alchemists did, to find an object that we can claim as a fundamental essence. For there are no objects to define, only infinite subjects, or rather, the vital materialist expanded subject, which I define as lively material. Material with a capacity to act that we must respect as an intimate part of every one of us.

In the context of synthetic biology, genetics and the desire to make with living material, I have found that technology serves to distance us from life as subject and that anthropomorphic practices in the laboratory allow a consideration of life as integral to subjectivity and not a separate other. In a gendered reconsidering of the organism as a leaky vessel rather than a controllable chassis, the subjectivity of the organism is revitalized. Psychotransgenic workshops that practice empathetic performative actions contribute to ethical consideration of the organism as lively subject, rather than simply resource. Through anthropomorphizing the organism as a sentient community-being of cells, it is possible to consider lively material as the alien/other that is also a part of the self, the xenomorph - a being that cannot be contained by the body and as such deserves our respect. Thus in generating with life, making new forms that we then use or consume, we can acknowledge our imposition, mindful that life is more than human and our actions towards it are ultimately autophagic actions on the xenomorphic self.

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