



Figure 1: *The Synthetic Kingdom*, (still from film). Director, Alexandra Daisy Ginsberg, 2009, Animation Cath Elliot, Little Giant Pictures. Image courtesy of the artist.

Introduction

In the context of the western minority world, everyday experiences of the non-human are in part framed by the legacy of industrialisation. Developing biotechnologies and increasing urbanisation are having a profound effect on how we understand and interact with life and the environment (Jones, 2011). Since the first patent on life was passed in 1980, there has been an exponential growth of the biotech industry. It is argued, that in such a climate, it is imperative these rapidly assimilated technologies, having a fundamental impact on the future of non-human and human life, must be debated and questioned. As Cass and Catts (2008, p.178) assert, in the context of economically driven research there is little time to reflect on the social and cultural implications of manipulating non-human life.

The arts play a crucial role in setting up a way to navigate these contemporary conditions, offering a platform for communication, reflection and interrogation. By using bio-art to re-frame this engagement with the non-human, outside of hegemonic contexts, this research aims to take these practices out of the 'ivory tower' to generate awareness directly in the

l'ifeworld' of the viewer, participant or student. Through the implementation of particular projects, this research operates across the contexts of gallery, public and educational spaces to disseminate bio-art in multiple ways.

The practice of bio-art, a combination of art and life sciences, which often uses “wet” biology (living materials) as the medium, provides a site where developing biotechnologies, our understanding of non-human life, and our relationship to it can be explored. Biological art embodies these technologies at a point of negation between the institutions in which they are located. It also represents an artistic interrogation through interdisciplinary acts. This process aids in the development of reflexive cultural analysis and scientific method. Bio-art draws directly from biotechnologies already operating in the lifeworld (Husserl, 1954; Habermas, 1987). As such, it can be used to generate new ways of interacting with non-human life, providing discourse on contemporary issues.

This paper will highlight two key projects that have been developed as a part of this research, applying these ideas in the contexts of secondary education and public exhibition respectively.

Project One: Bio-Tech Evolution: Future Engagement With The Non-Human (Art-Science School Project)

Negotiating hegemonic contexts using interdisciplinary education practices

This section details the art-science project that was run for Year 11 art students in the Gifted and Talented Visual Arts Program (GATE) at Balcatta Senior High School. The project aimed to encourage students to consider their impact on the environment; their responsibilities towards other forms of life; and to offer a site where related biotechnologies and their social and cultural implications could be addressed through an arts activity. As a learning environment, the (GATE) program is focused on the ‘opportunity [for students] to gain an understanding of how their art-making fits into the larger community’ (2010, p.2). This concept reinforces a key aspect of the project, and of the research generally, in terms of fostering the communicative capacity of an arts practice as a tool to examine contemporary contexts.

The project, drawing on current Australian art and science secondary curriculum, referenced established tertiary art-science units run through SymbioticA at The University of Western Australia and *Abiogenesis*, a secondary art-science extra-curricular unit run by art-

science collaborator and scientist Gary Cass. There will be an examination of the ways in which the project built upon these precedents, while negotiating and developing specialist disciplines with particular reference to the theories of Ken Robinson.

As a cross-disciplinary mode of practice, bio-art can be used to negotiate established art and science contexts as the communicative outcomes are not necessarily predetermined by either institutional context. This process also frees access to scientific information beyond traditional frameworks, paving the way for public participation and the creation of hands-on science activities in an arts context in collaboration with practicing scientists and environmental conservationists.



Figure 2: Students extracting DNA with Gary Cass (*Abiogenesis* Founder), at *Biotech Evolution: Future Engagement with the Non-Human*, GATE, Balcatta Senior High School, 2011. Photograph D. Franklin.

The lecture content presented the students with a number of perspectives and cultural debates dealing with scientific research and bio-arts practices. Within each class, the students were asked to consider their own ethical position on developing technologies and in particular during their real-time engagement with non-human life. This teaching methodology

was used to draw on the learning guidelines set up by the WA Science and Art curriculum models.

In relation to the research agenda the project developed the following outcomes:

- Firstly, it provided a site of direct *real-time* engagement with non-human life through the introduction of 'wet laboratory' sessions, based on microbiology, mycology, entomology, and plant and human DNA extractions. By introducing the life sciences into an arts context, a key agenda informing the research was put into practice, that is, a re-invigoration of interactions with non-human life and living systems, and the integration of this experience into the lifeworld of the participants via a school activity. In addition, students learn and understand the science, before they apply it to their art practice (Cass, 2012). During these sessions, students were also asked to consider the ethical implications of care and responsibility for other life forms and their associated environmental needs. This approach draws on precepts and philosophies set up by the tertiary units run through SymbioticA: *Art and Life Manipulation* and *The Aesthetics of Care*. In relation to the development of an art-science curriculum framework within tertiary contexts, the methodology of cross-discipline education is relatively new. This school project however, offers a starting point for secondary students to develop an interest in such fields. The workshops run through SymbioticA do however extend further, through their application across local, national and international contexts.
- Secondly, the project introduced additional interdisciplinary models to the teaching pedagogies and, in so doing, challenged the standardisation and separate disciplinary specialism practices of current education systems. This was in line with the position of Robinson, who feels that we operate within 'a system of education that is modelled on the interests of industrialisation ... [It is] increasingly about conformity [and] standardised curricula ... I believe we've got to go in the opposite direction [and] change the paradigm' (2010). This was achieved through a re-location of scientific laboratory work within an arts context and via the introduction of multiple teachers into the program from the fields of science and conservation. A precedent of this school project, the *Abiogenesis* unit, also builds on current interests in the science curriculum, especially in relation to the importance of developing science communication skills, as identified in the *WA Curriculum* 'Science Inquiry Skills: Communicating scientific ideas' (2010). Through the unit 'students learn about

expressing and understanding how to communicate science through art' (Cass, 2011).

Both guest presenters, Yvonne Sitko, founder of the *WA Birds of Prey Centre*, and Gary Cass, *The Scientific Creativity Initiative* and founder of the art-science unit *Abiogenesis* (Figures 2 and 5), also actively operate and communicate across multiple contexts, including exhibitions, fairs, and public arenas, locally, nationally and internationally. Each educator brought a new level of engagement to the topics in the project, due to their personal contextual influences, agenda and lifeworld experiences.

The emphasis on creative thinking (Robinson, 2006) in the project was aimed to set up a premise for future science-art secondary education curriculum. However, such a model is not limited to art-science contexts and discourses and could easily be applied to multiple forms of secondary education, the consequent outcome of which will encourage a curriculum based on reflexivity rather than industrial output (Robinson, 2010). Cass builds on Robinson's ideas when talking about related cross-disciplinary activities as 'one way of bridging the gaps between a compartmentalised educational system, allowing future students to become more interdisciplinary with a broader knowledge base' (2011). This process was extended through the public exhibition of the students' bio-artworks at the school.

The (GATE) program was also selected due to its facilitation of exhibitions within the school. Through an annual community exhibition, this arts context offered a site where critical engagement was promoted and, through student artworks, communicated to the public. This formula of reflexive engagement builds on the learning outcomes as described by the *WA Curriculum*: an 'arts practice, which depends on ... analysis, synthesis, creativity and decision-making can help equip our young people for success in the 21st century' (2010, p.2). This is of particular concern to Robinson who argues that there needs to be a greater focus on creative thinking over industrial output in relation to all current disciplines in the curriculum to help 'take students into this future we cannot grasp' (2006). He asserts that 'creativity is as important now in education as literacy and we should treat it with the same status' (2010). He argues that to be culturally equipped to deal with the uncertainty of the future, its rapid and shifting circumstances, students need to use reflexivity, critical and lateral thinking. To problem solve and 'see multiple answers – not one' (2010). Interdisciplinary education models embed the student in this process from day one. The

students were given the option of including 'wet biology' as a part of the work. This process required a consideration of the welfare of the living component during production, exhibition and completion of the project. In terms of the aesthetic parameters set by the current contemporary bio-art field, as the students had no prior experience of these practices, their interpretation and production of the artworks were self-directed and open-ended.

Robinson also suggests that creative thinking (reflexivity), if developed as a part of the learning outcomes and pedagogies across the specialist curriculum beyond arts contexts, offers an ideological position which could be applied beyond the school context and into industry. This method of teaching could also provide an ideological space where the process of 'systemic colonisation' (Habermas, 1970) could be negotiated. It has the potential to be used to generate new ways of approaching the research methodologies and the development of new technologies, bridging the gap between industry production and cultural analysis. As reiterated by Richard Levins, 'contributions to science from beyond the ivory tower are forcing a rethinking of traditional models of knowledge generation, evaluation and communication' (2008, p.35). Cass also asserts, 'a possible re-introduction of philosophy and cultural theory into the sciences makes sense, to give the practitioners the opportunity of developing new ways of thinking about the future scientific and *social implications* of their research' (2010) [italics added].



Figure 3: Students extracting DNA *Biotech Evolution: Future Engagement with the Non-Human*, GATE, Balcatta Senior High School, 2011. Photograph D. Franklin.



Figure 4: *Keep Safe your Identity*, Nicholas Lozanovski, 2012, *Creatures of the Future Garden*, June 21 –29, 2012, Spectrum Project Space, Edith Cowan University. Photograph, D. Franklin.

Thirdly, the project created a site where a relationship between the individual and broader contexts could be examined, through the subject matter of each class and a reference to local and global contexts. For each session there was a particular focus on local and global environmental issues or biotechnological futures. Through this students could consider a direct correlation between contemporary local and global contexts; and its role within their daily decisions (Giddens, 1991), or through the communication and production of an art piece. This process developed a framework for the students to build on ideas of communicative action and ethical citizenry in society. This agenda provides a model that reinforces the interests of current WA secondary science curriculum (2011) by allowing students to apply knowledge to their own lived experiences and actively contribute to broader contexts. In addition the artworks produced by the students were also exhibited to the public. This activity extends the debates and discussions raised by the project beyond the classroom and into the lifeworld and public sphere. This agenda is put into practice through the facilitation and development of the project. In relation to the longevity of the project, a number artworks developed during this school program were also exhibited alongside established interdisciplinary artists as a part of a curated exhibition and workshop that aimed to generate further community engagement with biotechnologies and non-human life.

Student Feedback

'You get a new outlook on both subjects, you can find new ways to make social comments by using both art and science' (personal comment, October 22, 2011).

'It's challenged my view of art and science' (personal comment, October 22, 2011).

'It's a productive way to learn because it's hands-on, which can be fun but also educational. (personal comment, October 22, 2011).



Figure 5: Yvonne Sitko with Aussie the Wedge-Tailed Eagle from WA Birds of Prey, at *Biotech Evolution: Future Engagement with the Non-Human*, GATE, Balcatta Senior High School, 2011.

Project Two: Creatures of the Future Garden Exhibition

Curated bio-art exhibition at Spectrum Project Space, Edith Cowan University

June 21 – June 29 2012

Contributors

Trish Adams (VIC), Tarsh Bates (WA), Donna Franklin (WA), George Gessert (USA), Alexandra Daisy Ginsberg (UK), Kirsten Hudson (WA), Svenja J Kratz (QU), Angela Singer (NZ), *The “Made Generation” Collective*: Gary & Susie Cass from *The Scientific Creativity Initiative*, Balcatta SHS students: Jesse Brown & Nicholas Lozanovski, St Mary’s Anglican Girls College student: Sasha Whittle (WA).

In line with the views of exhibiting artist George Gessert (1994, p. 9), this exhibition aimed to develop the concept of gallery spaces that facilitate multiple uses: as a site of conservation; as a site of wilderness; and as a site for education. Precedents for this exhibition include: *Biotech Art Revisited*; *Still Living*; *Technebiotics*; and workshops run through SymbioticA. These have included life science workshops presented alongside bio-artists. This exhibition contributed to the field by introducing young adults to the practice of bio-art and its associated philosophies, frameworks and ethical positions.

The agenda behind this exhibition aimed to generate further interest in animal welfare, the environment, science and the arts. *Creatures of the Future Garden* was a group exhibition of international, national, local, established and emerging inter-disciplinary artists, whose work investigates an engagement with the non-human. The artists research the ethics and politics of manipulating life and the practice of bio-art by examining interactions between humans, technology and biology. Each demonstrates a vested interest in re-invigorating an engagement with non-human life and in generating debate around developing biotechnologies. Of greatest potency, the artists raise issues regarding how culture continues to mediate and manipulate ‘nature’ – often with confronting outcomes. A number of the artists selected actively engage with the life sciences through artwork or collaborate with scientists in order to produce the work, such as cell-tissue culture, entomology, DNA extraction, and microbiology. The inclusion of emerging artists alongside established artists was a deliberate act. This non-hierarchical agenda aimed to offer a site where notions of the ‘ivory tower’ were broken down within the gallery context.



Figure 6: *The Remains of Algernon and the Poetry Orchids*, Svenja J. Kratz, 2011, Mummified foetal calf containing a living orchid painted with text. *Creatures of the Future Garden*, June 21 –29, 2012, Spectrum Project Space, Edith Cowan University. Photograph, Dan Cole, Image courtesy of the artist.

Building on Project One, I will follow with details on the exhibiting students while also referencing viewer reactions to the artworks and the *Birds of Prey* workshop. I was most excited to observe the confidence that the students demonstrated when discussing their work with the public. In particular, the students demonstrated that they understood the science, and clearly articulated an awareness of the relationship between arts research and cultural communication.

Nicholas Lozanovski, through his piece *Keep Safe Your Identity* (Figure 4), raises the issue of who has access to your body tissue, and genetic information, with reference to the developments in the Human Genome Project and the 'disputes and debates' surrounding human cloning. Lozanovski states that 'we should keep safe our identity' (2012, p.49), concerned that DNA mapping may become another form of surveillance and control, a resource for corporations to access and further categorise the individual.

Sasha Whittle's work, entitled *Definition* (Figure 7), represents 'the potential future, [in which] humans will be defined by what their DNA says rather than what sort of person they are. As DNA makes up our structural self, our face won't identify us, our DNA will' (2012, p. 51).

In *Imperfections of Immortality* (Figure 8), building on his artwork conceptualised during the secondary school art-science project, Jesse Brown 'will further question the need for the human to remain a soft machine!' He posits that in order '[t]o survive a future world that may be environmentally hostile, the human will require an upgrade: the merger of the soft machine with the hard machine. The Birth of the Cyborgian Being' (2012, p.45).



Figure 7: *Definition*, Sasha Whittle, 2012, Acrylic and DNA, MDF board. *Creatures of the Future Garden*, June 21 –29, 2012, Spectrum Project Space, Edith Cowan University. Photograph, Kelsey Diamond.



Figure 8: *Imperfections of Immortality*, 2012, Jesse Brown, Mannequin, aluminium, paper-mache, acetobacter bacteria. Photograph D. Franklin.

The artworks were selected to encourage the viewer to make connections between the content of the pieces and their own lived experiences. This was achieved either through associations to materials and physical triggers caused by the artwork content, living material or biological material of topics and issues raised. The works aimed to trigger memories of animal encounters and bodily reactions without being overt, too direct or literal. In conversation with viewers, they would often describe their experiences with other living things, and talk about current topics in relation to environmental concerns or developing technology, particularly in response to the works of Alexandra Daisy Ginsberg (Figure 1), Svenja J. Kratz (Figure 6), Trish Adams (Figure 9) and Angela Singer (Figure 10).



Figure 9: *HOST*, Trish Adams, 2010, (still from film). Original cinema photography, Carla Evagelista & Peter Kraft, Scientists: Indoor Honeybee Facility; Visual & Sensory Neuroscience Group; Queensland Brain Institute; and The University of Queensland. Image courtesy of the artist.

Audience Reactions

'The show has a positive outlook and depth to it that is often in contrast to other shows of this theme, the elements of each work have serious and confronting messages but also contain hope through the living – especially that one [*Life and Death Vessels: A Collection of Curiosities*] and the garden at the front [*Diaspora Monopoly*]' (personal comment, June 26, 2012).

'Plants, insects, taxidermy and all the things that make you think about humanity's place in the living world. We need shows like this that make you think. Too many art shows are visually pleasing without a lot of depth. When you stop and take time with this exhibition it has depth and substance' (personal comment, June 26, 2012).

Workshop

WA Birds of Prey

This workshop was presented and conducted by internationally recognised conservationist, bird of prey expert and 2009 Finalist for the Environmental Educational Awards, Yvonne

Sitko. The workshop introduced the audience to native birds, their biology and their role in the environment in a hands-on way. The participants had the opportunity to see and hold live birds.

Participant Reactions

'Excellent show with a fascinating subject and point of view. Birds of prey workshop is an excellent (and totally fun) way to involve the public. More exhibitions like this!' (personal comment, June 26, 2012).

'It was a privilege to have the opportunity to get so close to an animal you would never normally see. To see individual details, feathers, feet so close and hear about their lives' (personal comment, June 26, 2012).



Figure 10: *Hedge Row, Red Fox (vulpes vulpes)*, 2010, Angela Singer, Vintage taxidermy red fox and mixed media ceramic. Image courtesy of the artist.

Conclusion

This research draws on the work of theorists, sociologists and scientists, educators, artists and curriculum; I argue that the values in a culture greatly influence the understanding and manipulation of non-human life. Of particular concern are the hegemonic contexts of the corporate industries and mass media. The educational agenda at the heart of this research stems from a personal interest in generating opportunities for young people to experience

the life sciences in a hands-on way in conjunction with the practice of bio-art as a form of cultural analysis. As with most technologies that develop rapidly, it is the youth of today who will have to deal with the biotech consequences of tomorrow. The outcome for the project aims to demonstrate its role in contributing to a reflexive engagement with contemporary cultural conditions.

The agenda behind the development of this project within secondary education contexts, aims to set up a new site of pedagogy that uses cross-disciplinary arts-science practices as an artistic tool to critically engage with biotechnologies. As an interdisciplinary education model, the art-science project set up a site where multiple viewpoints could be discussed regarding the interrelationship between biotechnologies, industry, public opinion and arts communication. This project was developed in response to discussions with peers on finding a way to re-invigorate participation in science for young people, with a particular emphasis on generating a link between scientific practices and cultural analysis. This project puts into practice Ken Robinson's theories on education structures and how this needs to change as it is currently a model based on industrial output rather than creative thinking and reflexivity.

Bibliography

The first patent on life was passed by the US patent office for *General Electric Motors* and Ananda Chakrabarty. Initially refused to be unethical, the patent was appealed and accepted under the argument that as a bacterium, invisible to the naked eye, it was deemed to be 'just a chemical'. http://www.todayinsci.com/6/6_16.htm

- BROWN, J. (2012) *Creatures of the Future Garden* [Exhibition Catalogue], Perth: Spectrum Project Space, Edith Cowan University.
- CASS, G. (2010) *Abiogenesis Introduction*, www.bioalloy.org [accessed December 12, 2010]
- CASS, G. (2011) *The Scientific Creativity Initiative*, Seminar and Workshop Science in Schools Conference, The University of Western Australia.
- CASS, G. (2012) *Abiogenesis Unit*, Balcatta SHS: Personal Communication (June 30th 2012).
- CASS, G. & CATTS, O. (2008) *Biotech Art*, in *Art in the Biotech Era*, Adelaide: Experimental Art Foundation Inc.
- CATTS, O. & ZURR, I. (2004) *The Art of the Semi-Living and Partial Life: Extra Ear – ¼ Scale* <http://www.tca.uwa.edu.au> [accessed October 30, 2004]
- BALCATT SENIOR HIGH SCHOOL (2009) *Gifted and Talented Art Scholarship Program* [Brochure].
- GESSERT, G. (1994) *On Exhibiting Hybrids: Art and Technology*, supplement of CICRA, 90: 8-9.
- GIDDENS, A. (1991) *Modernity and Self-Identity: Self and Society in the Late Modern Age*, Cambridge: Polity Press.
- GOVERNMENT OF WESTERN AUSTRALIA CURRICULUM COUNCIL (2010) *Arts Curriculum Framework learning Statement for the Arts*, http://www.curriculum.wa.edu.au/internet/Years_K10/Curriculum_Framework/ [accessed April 16, 2011]
- HABERMAS, J. (1987) *The Theory of Communicative Action: Lifeworld and System: A critique of functionalist reason* (vol. 2) (trans. McCarthy, T.), London: Beacon Press.
- HAUSER, J. (2008) *Symbiotica Presents...Still Living: BEAP 07 Biennale of Electronic Arts Perth: Stillness Art and Science and Technology* [Brochure] Perth: Artrage.
- HUSSERL, E. (1954) *The Crisis of European Sciences and Transcendental Phenomenology*, Evanston: Northwestern University Press.
- JONES, D. (2011) *Longing for Connection: The Importance of Interactions with Wildlife in an*

- Urbanizing World, paper presented at the 4th *Biennale Australian Animal Studies Group Conference*, 10-13 July 2011.
- LEVINS, R. (2008) *Living the Eleventh Thesis*, in Da Costa, B. & Philip, K. (eds.), *Tactical Biopolitics, Art, Activism, and Technoscience*, Leonardo: Massachusetts Institute of Technology.
- LOZANOVSKI, N. (2012) *Creatures of the Future Garden* [Exhibition Catalogue], Perth: Spectrum Project Space, Edith Cowan University.
- ROBINSON, K. (2006) *Schools Kill Creativity*, TED Talks: Ideas Worth Spreading http://www.ted.com/talks/ken_robinson_says_schools_kill_creativity.html [accessed April 12, 2011]
- ROBINSON, K. (2010) *Changing Education Paradigms*, TED Talks: Ideas Worth Spreading http://www.ted.com/talks/ken_robinson_changing_education_paradigms.html [accessed April 12, 2011]
- SITKO, Y. (2011) *Birds of Prey School Incursions* <http://wabirdsofprey.com/school-incursions/> and <http://wabirdsofprey.com/> [accessed April 16, 2011]
- WHITTLE, S. (2012) *Creatures of the Future Garden* [Exhibition Catalogue], Perth: Spectrum Project Space, Edith Cowan University.
- Science: Acting Responsibly*, (2010) Curriculum Framework Guide – Science, http://www.curriculum.wa.edu.au/internet/Years_K10/Curriculum_Resources [accessed March 21, 2011]
- SymbioticA Activities* (2010) <http://www.symbiotica.uwa.edu.au/activities/projects> [accessed May 15, 2012]
- SymbioticA Courses* (2012) <http://www.symbiotica.uwa.edu.au/courses> and <http://www.symbiotica.uwa.edu.au/courses/mbiolarts> [accessed May 15, 2012]
- SymbioticA Workshops* (2010) <http://www.symbiotica.uwa.edu.au/activities/workshops> [accessed May 15, 2012]