

Sarah Robinson

School of Communication and Arts, Edith Cowan University

Rhizome: Non-toxic printmaking from the studio to the digital cloud and back

Keywords: Digital, Non-Toxic, Rhizome, Materiality, Studio

Introduction

This paper tracks the development of three-dimensional (3D) printmaking praxis, by focusing on a 'digital' weed growing amongst contemporary printmaking. It explores the use of 3D printmaking as a material process, integrating digital and non-toxic printmaking, which considers notions of the real verses non-real through simulacra. The concept of 'non-toxic' printmaking has filtered into the mainstream studio, alongside the dissolving parameters of traditional printmaking practice, eroded by a digital aesthetic. For the purposes of this paper all references to non-toxic printmaking allude to this 3D print technology. This PhD research, analyses the effect that digital technologies may have had on our perceptions of the real. Informed by fieldwork from the limestone geologies of Point Peron, Western Australia and Somerset Mendip, United Kingdom, it will integrate traditional and digital images of physical landscape. The 'immersive' experience in these limestone topographies through photography, journaling, and drawing will inform my studio practice. It is anticipated that this practice-led research will question how we define landscape, by asking what is real, virtual or simulacra. The research asks: if we become conditioned to see landscape through computer-generated digital technologies what cognitive impact will this have on our perception of the actual physical landscape? I expect to find reasons why digital technologies may have changed the way we see the physical landscape. This paper looks at the conceptual underpinning of this research beginning with simulacra, the theoretical framework, visualisation of the rhizome grid, the conceptual framework, and finally exploring notions of real verses non-real.

Simulacra

Jean Baudrillard in 'The Precession of Simulacra' (1994) states a simulacra in the simplest form is a copy of a copy for which there is no original. Whereas Jonathan Roffe (2005) comments 'Plato offers a three-level hierarchy of the model, the copy, and the copy of the copy which is the simulacrum'. He proceeds to extrapolate Plato's concerns further by writing: 'being a step removed from the model, the simulacrum is

inaccurate and betrays the model' (2005). This hierarchal model suggests a suitable framework to gain insight into three-dimensional printing, which finds increasing momentum in the field of medicine and engineering. In the international press, this new technology is exemplified by the ability to print a three-dimensional gun from web based blueprints, in the comfort of your own home (Ball, 2013). In the contemporary international arts context, Murray Moss curated 'Industrial Revolution 2.0' (2011). An exhibition of three-dimensional digital printing held at the Victoria and Albert Museum, London UK (The V&A Museum has recently acquired a copy of the 3D printed gun for display (2013)). A global 3D printmaking rational has also filtered into the Australian context in Jenna Downing's article 'An introduction to 3D printing' (2013) which extrapolated the three-dimensional printmaking options currently available, both commercially and for use in the home, including the Fused Deposition Modeling (FDM) process. A digital technology facilitated to print 'Rhizome: Non-Toxic Printmaking from the Studio to the Cloud and Back (Robinson, 2013) (Figure 10). A collaborative practice, initiated by discussions with Dr Kevin Hayward, School of Engineering and Heather Boyd, eResearch Coordinator, both from Edith Cowan University.

Preliminary research, initiated from the concept of a traditional potato cut print, investigated 'Autodesk 123D catch'(2013), a free computer programme available from the Internet. It is possible to upload photographic images, in this case 40 shots of the original potato, into the cloud. Cloud computing enables real time programs to be run concurrently on many computers whilst storing the digital aesthetic until you are ready to access it from anywhere. The cloud would have eventually sent back a three-dimensional mesh rendered from the photographs of the original potato, suitable to send to print. The opportunity arose for the potato to be scanned directly into a computer-rendering program (Figure 1), using a hand held scanner in the ECU School of Engineering; a material process that instantly constructed the required mesh, in real time.



Figure 1 Potato Scanning, (2013), *ECU Engineering Department*, using a Romer Absolute Arm with an integrated scanner, Photographer Courtesy of the Artist.

I cut the text 'rhizome' into the experimental potatoes, using traced letters, reversed from a digital computer font. The heights of the letters were checked for printing clarity by pressing into ink and transferring onto paper. This affirmed the correct depth of cut, from a traditional process that referenced the historical printmaking method, of a potato cut print that created a new simulacrum (Figure 2).

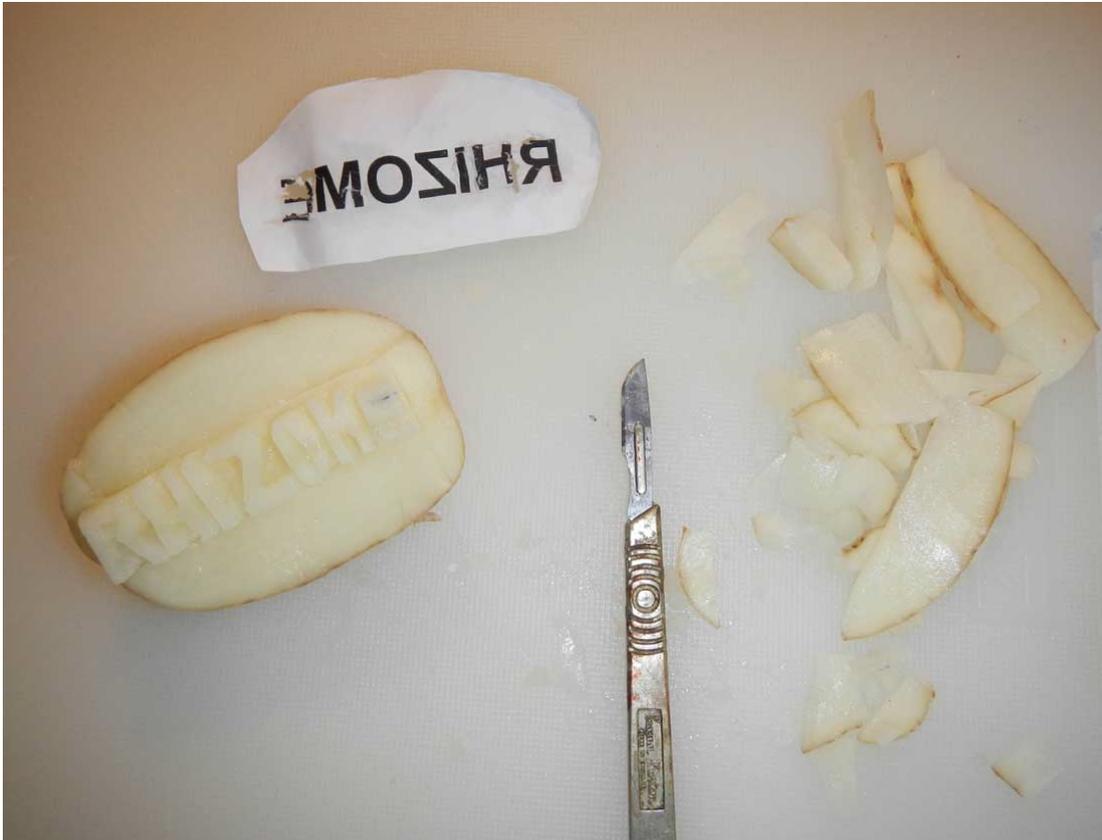


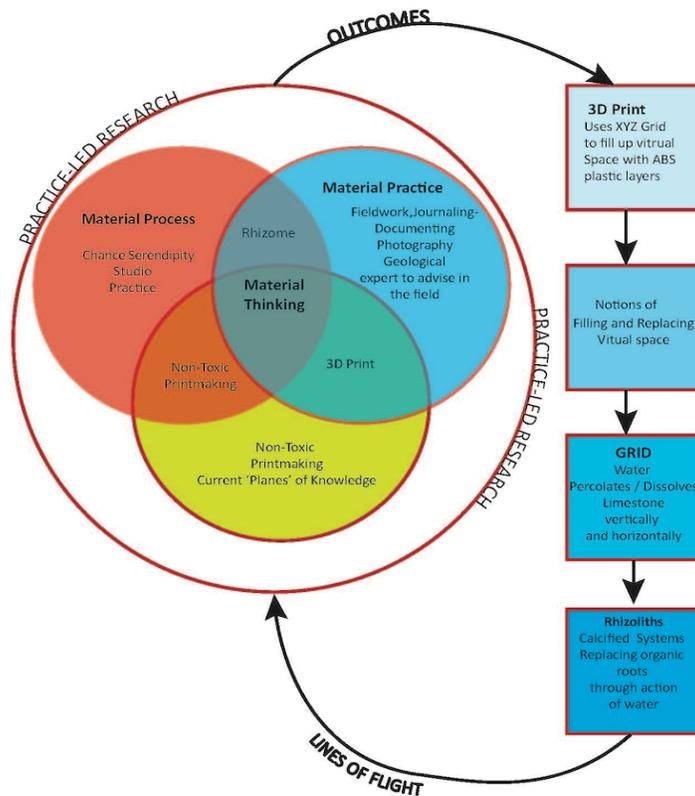
Figure 2 Studio Process, (2013), *Cutting the text into the potato*, Photographer Courtesy of the Artist.

The text 'Rhizome' was chosen, firstly to reflect the rhizomic creative way of thinking suggested by Deleuze and Guattari (1988). Secondly, because a potato is a rhizomic vegetable, whose root system extends underground, becoming a metaphor for the rhizolith forms found at Point Peron (Figure 3) in the Tamala limestone. Rhizolith forms are calcified root systems, which replace organic root systems with sand as water percolates through the sands above, depositing calcium carbonate around rotting or decayed 'rhizomes' to recreate anatomical structures of the original roots. Perhaps, a copy of the copy, by nature itself and a geological process that also constructs similar 'solution pipes' in limestone. These are vertical cylindrical holes formed in the limestone by the process of solution, often without any surface expression and filled with debris, similar in some sense to the Fortus 250mc printer as it extrudes its cylindrical acrylonitrile butadiene styrene (ABS) plastic. This extrusion process occurs through a nozzle in an x or y grid dimension and the z vertical axis, in effect providing the notion of filling up a virtual space, replacing the virtual with a physical reality that in effect has recreated something else, a simulacrum.



Figure 3 Rhizolith limestone structures at Point Peron, Western Australia, (2013), Photographer Courtesy of the Artist.

Theoretical framework



PRACTICE-LED RESEARCH METHOD

Figure 4 Sarah Robinson, (2014), *Diagram for Practice-led Research Methodology*.

The theoretical context and studio process (Figure 4) which this 3D print practice references, engages with Deleuze and Guattari's (1988) concept of the 'Rhizome'.

In a book, as in all things, there are lines of articulation or segmentarity, strata, and territories; but also lines of flight, movements of deterritorialization and destratification. Comparative rates of flow on these lines produce phenomena of relative slowness and viscosity, or, on the contrary, of acceleration and rupture. All this, lines and measurable speeds, constitutes an assemblage. (Deleuze & Guattari, 1988 p3-4)

According to Deleuze and Guattari, the rhizome has multiple entryways, a conceptual approach to creative thinking that this research engaged with, to identify the rhizoid

buds of contemporary knowledge in the field of non-toxic printmaking (Figure 4). The research anticipates segmentary lines of investigation exploding into a Deleuze and Guattarian 'line of flight'. The French translation of flight is '*fait*'; equivalent to flowing, leaking and disappearing, that can provide a metaphor for material investigations into the way water dissolves limestone to construct the rhizolith structures in the limestone landscape, refer to figure 4. It also metaphorically speaks for a conceptual flight which led me to Dr Kevin Hayward, (ECU School of Engineering) who directly scanned the original hand cut potato into the Polyworks computer program, to render its structural digital mesh. This process took considerable time, with specific engineering expertise required to clean up the mesh, known as a manual edit, to enable the 3D printer to access the digital information from a Standard Tessellation Language file (STL). This describes the surface geometry of a 3D object that creates the mesh. The nature of hand cutting text into the material body of a potato, inevitably creates, what can best be described as 'furry bits' in the incised letters, or in engineer terms 'noise'. This will not bode well with translation into suitable computer code required to send to the 3D printer, because it is simply too great a digital aesthetic (Figure 5).

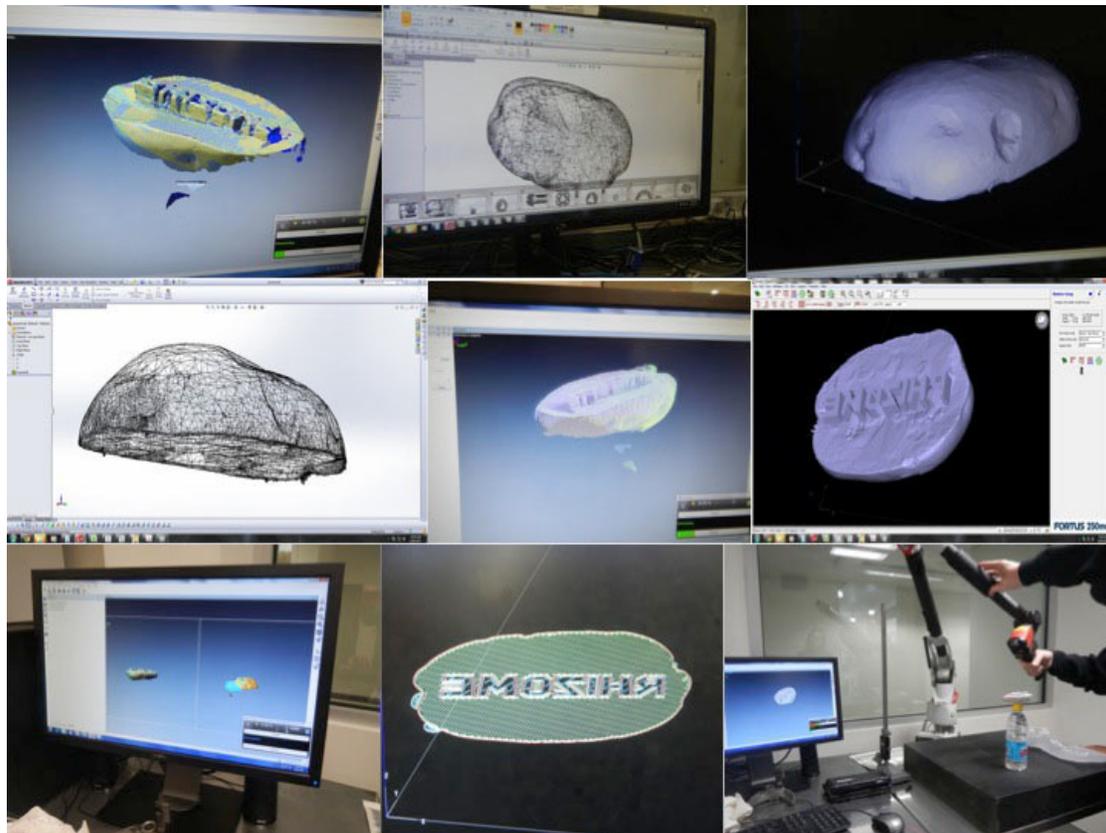


Figure 5 The Digital Aesthetic, (2013), *Computer screen image capture by Dr Kevin Hayward, ECU School of Engineering, Photographer Courtesy of the Artist.*

Potatoes rot, a poisonous bloom forms over the shrivelled letters; so two replacements were hastily sculpted, the night before a rescan. The engineer took a critical decision, and separated the rhizome text from the main body of the potato mesh, to clean up the digital information before reconstructing it as a whole. I did not anticipate this; the furry cells (reminiscent of the cells used in an osmosis test carried out at school) inside the type, held the material quality of a potato. I would rather it have been left as it was, a truer representation? This caused a 'Rupture' in my practice-led research, the potato would not be a true copy as I had envisaged, but one compromised by the digital aesthetic involved in transmission from the original potato to the cloud and back.

Finally the potato mesh STL file is sent to a Fortus 250mc printer (manufactured by Stratasys). Printed in 0.1778mm layer-by-layer plateaus of ivory white Acrylonitrile Butadiene Styrene (ABS), the extrusion of which is controlled by the computer manufacturing process. It is set to print on high resolution over night, taking 8.36 hours to complete. The 3D form will not be dipped in acetone, which would smooth its surface out after printing, thereby losing its digital noise and hence its digital essence.

Returning to the engineering workshop, I find the potato is metaphorically being 'peeled' (Figure 6), to remove the plastic excess that had supported the overhangs of the design during printing. These supports are laid down from a dissolvable plastic removed by acetone, but this process would have smoothed out the recognizable layers of the print, and lost clarity in its digitalization. The engineer smacks the potato against a doorframe, demonstrating how resilient it is, stop; it is a contemporary artwork, a rhizome. The engineer chuckles, they construct functional 3D components for clutch pedals, and mechanical parts, that are strewn around the engineering workshop.



Figure 6 Metaphorical peeling of 3D print, (2013), Photographer Courtesy of the Artist.

Visualisation of the rhizome grid

The digital aesthetic had flown from the studio to the cloud and back, as a line of flight immersed to question this particular 'material practice' referencing 3D printing technologies. It asked how the rhizomic concept relates metaphorically to a creative way of praxis. Metaphorically, the rhizome offers an overarching visualisation of an abstract grid system, based on vertical and horizontal planes. Therefore directly analogous to grids and structures. Planes, which can translate into a creative 'plateau', represented by the pattern of discourse surrounding non-toxic printmaking. Stagoll (2005) defines the 'plane' as a concept to explain thinking 'that is chaos and chance happening', a notion that I consider reflects my practice-led research methodology. Or perhaps Stagoll's alternative plane of 'structured orderly thinking on the other' can become the theoretical framework to link differences between toxic and non-toxic paradigms that question visions of the 'real verses non-real' physical landscape. After all, did not Deleuze and Guattari say that we could interpret their concepts defined in 'A Thousand Plateaus' how we like?

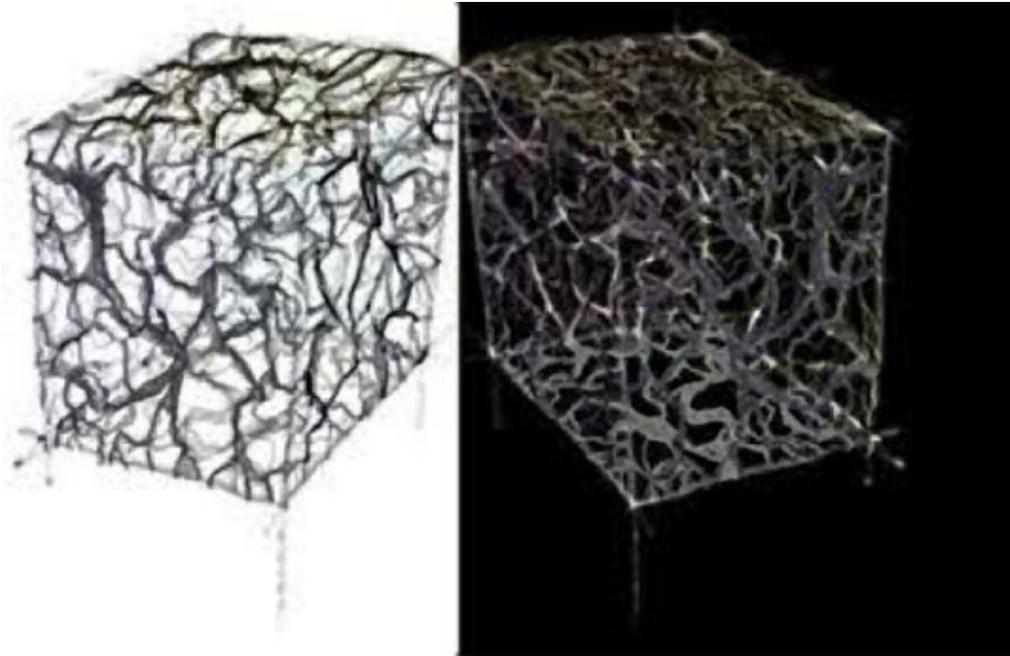


Figure 7 James Khazar, (2010), *Rhizome Intermezzo*, University of California / New Arts - Digital Media. (Exception to copyright. Section ss40, 103c. *Exception* Research or Study.)

Figure 7 (above) represents the visual concept of a rhizome and how that might pertain to a grid like structure (Khazar, 2010). It represents the way a rhizome works, with never ending tendrils or lines of flight. Yet this rhizome is confined in a square, which immediately resembles the 'pixel' the building block for digital images. Squares, which can in multiples, form a conceptual image of a grid. A digital computer landscape is constructed with the 'Fractal' (Koh, 2002) as the underlying mathematical building block. Its digital structure in computer-generated landscapes can therefore be construed as grid or plane like. The virtual grid is often held in the cloud through mathematical points that resonates with the 'Autodesk 123D catch' potato, which connects the digital to the real.

Conceptual framework

The conceptual framework employs a rhizomic rationale, documenting a printmaking arts practice affected by a digital aesthetic to question toxicity in etchings 'materiality'. In other words, a parallel grid system that could be constructed from Stagoll's (2005) conceptual 'planes', that metaphorically describe the notions of the development of non-toxic etching through rhizoid buds of developing knowledge. The lines of flight ever continuous, as different researchers move the non-toxic rational forward. This emergence of printmaking research into notions of non-toxicity, stems from historically

toxic techniques using nitric acid amongst other noxious materials. The rhizome model provides a useful comparison between the Internet and the current 'planes' of knowledge surrounding non-toxic printmaking.

In the broader context of my PhD research, this approach can be treated as a conceptual analogy to Deleuze and Guattari's 'Plane of consistency' (1988), to visualize the critical engagement in my praxis. Their idea of 'immanence' meaning: remaining and existing within, can best describe the way in which I will immerse myself within the identified limestone localities of Point Peron and Somerset Mendip. The non-toxic plane provides a surface in which the chaos of my thoughts can sit alongside structured thought that is separate from the 'lines of flight' that will happen as my research develops. I consider the studio process, which led to the development of the 3D potato print, to be a line of flight that exemplifies the need to define the term non-toxic. This is both in the 3D printmaking context of this paper, and in the broader sense of my PhD research, to define the term 'non-toxic' and clarify its actual meaning in printmaking terms.

Real verses non-real

The impact of digital technology in printmaking has been critically debated over the last 25 years. Terms like the 'Digital Aesthetic' have been integrated into everyday language. For example, the 'Digital Aesthetic 3' conference held at the University of Central Lancashire (Meigh-Andrews, 2012) provided a platform to discuss the ongoing nature and place of digital art across a broad range of discipline areas.

In the context of contemporary printmaking practice, the differentiation between a digital photograph and a digital print is questionable. The pixel underlies both digital image outputs, yet conceptually, perhaps the photograph and the digital print represent two different outcomes. The majority of photographers have changed to a digital aesthetic and are editing images using computer programmes such as Adobe Photoshop. In contemporary printmaking the true digital print utilizes the technologies of computer programs as tools to manipulate an image on many levels. This might be to add, subtract, select, layers to manipulate an image or parts of it, before it is translated into a specific printmaking technique. This approach in preparing printmaking positives, references historical printmaking processes yet are multi-disciplinary.

Elizabeth Delfs provided the Impact 7 Printmaking Conference with an overview of the Fremantle Arts Centre Print Award's history expressing that; 'the competition is inclusive of photographic work and multimedia works' (2012). Delfs frequently refers to the interdisciplinary nature of print. Entries by Eva Fernandez (2011), (Figure 8) and Christophe Canato (2011), (figure 9) are presented as digital photographs, which are clearly acceptable to the award.

However they exhibit no connection to the arena of contemporary printmaking, providing no engagement with the debate surrounding integrated printmaking practice or how the digital could be used as a sophisticated tool in the layers of a print, given that the award exhibition traditionally placed itself in the area of printmedia, not photography.



Figure 8 Eva Fernandez, (2011), '*El Camino Del Guia Desconocido (The Way of The Unknown Guide)*', Archival digital print on fine art Paper, 85cm x 190cm. (Exception to copyright. Section ss40, 103c. *Exception* Research or Study.)



Figure 9 Christophe Canato, (2011), *Women of Jerusalem*, Archival Giclée print, 150cm x 100cm. (Exception to copyright. Section ss40, 103c. *Exception* Research or Study.)

Sasha Grishin in 'The Impact of Digital Technologies on Contemporary Australian Printmaking' (2012) epitomizes this situation by commenting, 'this paper questions the existence of a Digital Aesthetic in Contemporary Australian Printmaking'. Yet in the United Kingdom, acute discussions regarding the notion of what constitutes a digital print have already taken place (Meigh-Andrews, 2012). The digital rational prompts arts practitioners to question how to interpret a digital print. Frequently, confusion appears in the use of 'digital' in printmaking terms, especially in the contemporary art field. However this discourse provides an opportunity for clarification within the lexicon of the digital aesthetic.

Conclusion

A Deleuze and Guattarian 'rupture' had occurred between an artist and engineer, with the intervention of the engineer, the 3D print had inadvertently become a simulacrum of

a potato. In the three level hierarchy of the Plato model (trans. 2007) the hand cut potato became the copy, the construction of a virtual computer mesh, became a copy of the copy, the ABS plastic 3D potato print possibly became the simulacrum.

The print, 'Rhizome: Non-Toxic Printmaking From the Digital Cloud and Back', (Figure 10) was submitted for entry to the Fremantle Print Award 2013. A humble potato sought out the territory that lies between non-toxic and toxic printmaking. An assemblage, achieved by tracing the original rhizome through a scanning process, to create the digital aesthetic, that could be stored indefinitely in the cloud. Deleuze and Guattari discuss the gestural and other semiotic systems that regain the freedom from the original tracing. 'What distinguishes the map from the tracing is that it is entirely oriented toward an experimentation in contact with the real' (1988).

The 3D potato print was subsequently rejected from the Fremantle Print Award 2013, so where is my line of flight now? Could the 3D potato print be defined as non-toxic because, as the 3D printer manufacturer states: 'Fortus systems don't produce noxious fumes, chemicals, or waste' (2011). Or perhaps, my rhizome will be constructed using food 3D printing technologies, to create an edible simulacrum? As simulacra precedes the real and the original may no longer exist, the question of what is real, virtual or simulacra turns full circle.

The potential for creative thought that occurred in the praxis '*Rhizome: Non-Toxic Printmaking from the Studio to the Digital Cloud and Back*', (figure 10) highlights the overriding advantages of collaborative practice, in creating ruptures between disciplines. In the broader context of the ACUADS Conference 2013 dialogue, the studio can now exist in the 'spaces' between collaborative practices. The experimentation that occurred through collaboration between disciplines, and the materiality of a simple potato, brings me to conclude that digital photographs may have superseded the real print; a conclusion that ultimately drives me to take a handheld 3D scanner into the field, immediately.



Figure 10 Sarah Robinson, (2013), 'Rhizome' (*From the Studio to the Digital Cloud and Back*), three-dimensional digital print, 3.5cm x 6cm x 9cm, Fused Deposition Modeling using a Romer Absolute Arm with an integrated scanner/Polyworks mesh software and Fortus 250mc printer, Photographer Courtesy of the Artist.

References

- AUTODESK, I. 2013. *Autodesk 123D Catch - Turn photos into 3D models* [Online].
- BALL, A. 2013. *Blueprints for 3-D printer gun pulled off website* [Online].
- BAUDRILLARD, J. 1994. *Simulacra and Simulation - The Precession of Simulacra*, United States of America, The University of Michigan.
- CANATO, C. 2011. *Women of Jerusalem*. Fremantle Arts Centre: Fremantle Arts Centre Print Award 2012, Catalogue p.27.
- DELEUZE, G. & GUATTARI, F. 1988. *A Thousand Plateaus -Capitalism @Schizophrenia*, London, The Athlone Press Ltd.
- DELFS, E. 2013. Fremantle Arts Centre Print Award Supported by Little Creatures Brewing: Novelty Cheques, Free Beer and New Audiences. *In: INTERNATIONAL MULTI-DISCIPLINARY PRINTMAKING CONFERENCE*, T. M. U. C. C., ed. Impact 7, 2013 2012 Melbourne. Monash University Publishing: Monash University Publishing, 151-156.
- DOWNING, J. 2013. An Introduction To 3D Printing. *Imprint - The Journal of The Print Council of Australia Inc.*, 48, 24-25.
- FERNANDEZ, E. 2011. 'El Camino Del Guia Desconocido (The Way of The Unknown Guide)' (Exception to copyright SS40, 103C, Research or Study). Fremantle Arts Centre - Print Award 2012 Catalogue.
- GRISHIN, S. 2013. The Impact of Digital Technologies on Contemporary Australian Printmaking. *In: INTERNATIONAL MULTI-DISCIPLINARY PRINTMAKING CONFERENCE*, T. M. U. C. C., ed. Impact 7, 2012 Melbourne. Australia: Monash University Publishing, 186-189.
- INCORPORATED, S. 2011. *Fortus 250mc* [Online].
- KHAZAR, J. 2010. *Unknown* [Online]. University of California / New Arts -Digital Media.
- KOH, A. 2002. *Dramatic Landscapes - Cellular Automata Modeling of Landscape Phenomena*. Monash University.
- MEIGH-ANDREWS, C. 2012. *Digital Aesthetic 3* [Online].
- MOSS, M. 2011. *The Making of Industrial Revolution 2.0 at the V&A - YouTube* [Online].
- NEWSPAPER, T. G. 2013. *V&A Museum to Display Printed Gun* [Online]. United Kingdom: BBC News Entertainments and Arts. [Accessed 15th September 2013].
- PLATO trans. 2007. *The Sophist*.
- ROBINSON, S. 2013. *Rhizome: Non-Toxic Printmaking from the Studio to the Digital Cloud and Back*. AP ed.

ROFFE, J. 2005. Simulacrum. *In*: PARR, A. (ed.) *The Deleuze Dictionary*. Edinburgh University press.

STAGOLL, C. 2005. *The Deleuze Dictionary*, Edinburgh University Press Ltd, 22 George Square, Edinburgh.