2017

Imperceptible Realities: An exhibition – and – Digitalisation: Re-imaging the real beyond notions of the original and the copy in contemporary printmaking: An exegesis

Sarah Robinson
Edith Cowan University

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Imperceptible Realities

An exhibition

– and –

Digitalisation: Re-imaging the real beyond notions of the original and the copy

in

contemporary printmaking

An exegesis

This thesis is presented in partial completion for the degree of

Doctor of Philosophy

Sarah Robinson

Edith Cowan University

School of Arts and Humanities

2017
Abstract

This PhD practice-led research project provides a broad overview of how newer print technologies can bring about enhanced understandings of the world whilst simultaneously questioning the value of such processes in contrast to traditional means of image making. My curiosity pivots on the worry that something essential about representation of the real might be lost if humanity were to embrace digital methods only. Through my creative project I address my concerns to re-image representations of the real beyond notions of the original and the copy through contemporary printmaking. The research culminated in the exhibition Imperceptible Realities and an exegesis.

In examining Jean Baudrillard’s concept of simulacra this research argues for the continuing relevance of traditional etching techniques through a pivotal case study that scrutinised Rembrandt van Rijn’s etching The Shell (Conus marmoreus). In contrasting traditional etching techniques with newer methods of digital printmaking a significant copy, derived from a similar shell specimen that Rembrandt had observed, manifested itself in contemporary 3D print. The copying process focused the investigation into questioning the aesthetic value of this new shell in digitalised 3D form. In the contemporary printmaking field there is evidence for the continued integration of traditional and digital approaches to printmaking. New pathways were examined in printmaking to allow creative explorations of visual boundaries between contemporary images affected by digital erasure.

The innovative use of photogrammetry software focused the investigation into the effects of digital capabilities on image making. The effect of examining the digital relationship in contemporary printmaking revealed that ignoring aesthetic differences between the original and copy brought about by digitised re-imaging are seemingly lost at the expense of disengagement with the physical world. As a result digital and traditional spaces that meet
collaboratively through print are advantaged in the 3D printed copy itself and employed to create new understandings in creative practice. Viewing observed differences in the 2D and 3D printed copy itself became key in creating new images, beyond a hybridised printmaking process—such understandings that examined the divisive relationship between digital and traditional printmaking processes becomes invigorated with possibility. This research posits such a position by suggesting that if traditions in the printmaking field are ignored by the continued digitalisation of images through and within the employment of technologies, something is lost. Perceptual experiences of the physical world are seemingly misplaced at the expense of replacing such immediate experience with simulacra and an inward bias toward the screen.

Adopting a practice-led research methodology revealed the subtleties of the ongoing relationship of digital capabilities affecting the materiality of traditional printmaking. The applications of innovative interdisciplinary discoveries to my contemporary arts practice drew on strong partnerships and collaborative relationships developed with the fields of chemistry, engineering and science. I applied these discoveries to my contemporary arts practice to examine the effects of digital capabilities and the materiality of traditional printmaking. To embrace conceptual growth creative work the research drew on philosopher Gilles Deleuze and psychiatrist Félix Guattari’s notion of the rhizome.

The presence of simulacra in the world has continued to expand as digital technologies proliferate. The application of traditional printmaking and digital printmaking through open thinking offers a different way to understand physical aspects of the world and create propositions that go beyond re-imaging the real.
Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

- incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education
- contain any material previously published or written by another person
- except where due reference is made in the text of this thesis, or
- contain any defamatory material.

Signature

Sarah Robinson

Date: June 2017
Acknowledgements

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I have drawn breath in caves, climbed a radar tower positioned on sand dunes, traversed limestone cliffs and the beaches below, and entered the chemistry laboratory—for this wonderful access to science and geology I thank the following people. Associate Professor Paul Bourke, formerly of the University of Western Australia for his extensive support in helping me access and understand photogrammetry techniques. In relation to the chemical analysis of *Xanthorrhoea preissii* resin, I thank Dr Sze How Bong and Dr Joel Gummer at the Separation Science and Metabolomics Laboratory (SSML) at Murdoch University. I also extend great thanks to the following people: Mark Datodi for arranging access for me to use the nitric-acid etching at Central TAFE, (Training and Further Education) Perth; Alan Smith from the printmaking department of the Royal College of Art for sharing his etching expertise; Julia Coggins and all the staff that I met at Yanchep National Park, in particular Rob Susac and the amazing cave guides with whom I conversed underground; John Bunting for
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Research Output

Academic Papers


Conference Proceedings


Robinson, S. (2014). *Drawing in the dark yet I still had my eyes closed—What we may believe to be real or not: From Plato’s Cave to contemporary 3D print*. Paper presented at the Edith Cowan University, Centre For Research In Entertainments, Arts, Technology, Education and Communications (CREATEC) Colloquium, Mt Lawley.

Exhibitions

Solo


Group


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<td>2D</td>
<td>two dimensional</td>
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<tr>
<td>3D</td>
<td>three dimensional</td>
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<tr>
<td>ABS</td>
<td>acrylonitrile butadiene styrene</td>
</tr>
<tr>
<td>ACUADS</td>
<td>Australian Council of University Art &amp; Design Schools</td>
</tr>
<tr>
<td>BBC</td>
<td>British Broadcasting Corporation</td>
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<tr>
<td>CAD</td>
<td>computer-aided design</td>
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<tr>
<td>CREATEC</td>
<td>Centre For Research in Entertainments, Arts, Technology, Education and Communications</td>
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<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
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<tr>
<td>DNA</td>
<td>deoxyribonucleic acid</td>
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<tr>
<td>DPI</td>
<td>dots per inch</td>
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<td>ECU</td>
<td>Edith Cowan University</td>
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<tr>
<td>FDM</td>
<td>fused deposition modelling</td>
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<tr>
<td>IMPACT</td>
<td>International Multi-disciplinary Printmaking, Artists, Concepts and Techniques</td>
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<td>LED</td>
<td>light-emitting diode</td>
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<tr>
<td>OBJ</td>
<td>object (file)</td>
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<td>PLR</td>
<td>Practice-led research</td>
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<tr>
<td>PNG</td>
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<tr>
<td>SLSA</td>
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<tr>
<td>SOC</td>
<td>Society of Cinematographers</td>
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<tr>
<td>SSML</td>
<td>Separation Science and Metabolomics Laboratory</td>
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<tr>
<td>STL</td>
<td>standard tessellation language (file)</td>
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<tr>
<td>TAFE</td>
<td>Training and Further Education</td>
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<tr>
<td>UK</td>
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List of Definitions

Digital Terms

**3D Print:** 3D print technologies used to print 3D objects from a digital, object file (OBJ), which is a geometry definition file format. While a standard tessellation language (STL) file is stereolithography computer-aided design format software, rapidly developing through science, medicine, data visualisation and creative-practice applications.

**Cloud computing:** A network system whereby data storage can be centralised but accessed online from anywhere.

**Digital:** In the scope of this research, computer software was engaged to either create digital computer code/data for 3D printing or to digitally manipulate such code or scanned and hand-drawn images, prior to creating inkjet printed positives for photo etching. In manipulating such digital code or the digitally scanned image, Agisoft PhotoScan, Adobe Photoshop, Adobe Illustrator, and Blender software were employed to transform parts of, or the entire, original image.

**Digital print:** In the context of contemporary printmaking the boundaries defining a *digital print* are often blurred. The production of a *digital print* might employ the technologies of computer software, as a tool to manipulate an image on many levels prior to printing the final printed output, be it a 3D print or inkjet acetate for transferring the image onto a photo etching matrix. For this research the term *digital print* refers to artworks that encompass digital code/data in their production. An opportunity exists to clarify the boundaries of a *digital print* within the lexicon of the digital printmaking aesthetic. Perhaps boundaries between the digital aesthetic and print no longer exist, a question that is, for now outside the scope of this research.
Fractal: A mathematical term for a geometrical figure that is self-similar at different scales. The creation of this term is credited to Benoit Mandelbrot (1983), who described the theoretical fractal in relation to geometric patterns in nature. Fractal geometry underpins computer-based modelling.

Giclée Print: Inkjet printing onto a variety of substrates such as canvas, vinyl, photo and printmaking paper: originally a term for Iris large format colour inkjet printing.

Mesh: A computer mesh consists of triangles arranged in 3D space to create the impression of a solid object. Its three-corner points or vertices define a triangle (Technologies, 2016).

Normals: In the geometry of computer graphics, a normal is a selected vertex that emanates from the centre of each triangular mesh face. A directional vector or line positioned in a particular direction indicating the orientation of the individual triangular faces that construct a mesh.

Photogrammetry: Science of making measurements from photographs by mapping surface points. Photogrammetry digitally stitches selected points together to construct 3D objects outputted through computer software.

Pixel: In digital imaging, the pixel refers to the pinpoint square, which is one of many that form a computer image.

Stereophotogrammetry: Science of measuring three-dimensional coordinates of points on an object. Employing measurements made in two or more photographs taken from known structural positions which identify common points from each photograph.
Etching Terms

**Etching:** Image etched into metal plate or matrix using a mordent such as ferric chloride, nitric acid or saline sulphate.

**Ferric chloride:** Mordent used to etch copper plates.

**Hard ground:** A layer of bitumen and wax covering etching plates that is impermeable to acid. Non-toxic water-based alternatives are now available for example: Lascaux Hard Resist.

**Non-toxic:** While this term is commonly used (and is used throughout this exegesis), no substance is non-toxic when the substance’s entire potential is considered. The term ‘low-toxic’ is often used instead.

**Saline sulphate:** A non-toxic mordent made from copper sulphate and sodium chloride used to etch aluminium and to develop or remove photopolymer film in photoetching.

**Toxic:** Something that is poisonous.

**Wax tapers:** Used for smoking a plate to leave a layer of carbon over a hard ground. The carbon from the wax tapers smoke chemically bonds with the hard ground, leaving a dark black surface. This is advantageous when drawing on the plate because of the heightened contrast with the exposed metal underneath the hard ground.

**Photoetching:** A photographic printmaking process using Dupont ImagOn film to transfer digital or photographic images onto an etching plate.
Geological Terms

**Dolomitic Conglomerate**: A coarse-grained rock consisting of fragments of other rocks such as carboniferous limestone and sandstone. This is locally known in Somerset (UK) as pudding stone because of its pudding like appearance.

**Carboniferous limestone**: Carboniferous limestone is either a fine calcite mud, which is precipitated from warm shallow seas, or a shelly limestone, which is formed by fragments of animals such as corals (University College London, 2016).

**Flowstones**: Formed by sheets of calcifying water flowing along the floor of a cave or down a cave wall, typically associated with limestone caves.

**Rhizoliths**: Cylindrical structures in and around fossilised roots, which are formed through the movement and precipitation of carbonate (Bunting, 2011).

**Solution pipe**: Vertical cylindrical holes formed in limestone by the process of acid rain calcification of the limestone, the solution pipe is often without any surface expression and often filled with soil debris (see Finlayson & Hamilton-Smith, 2003, (P.41).

**Tamala limestone**: Medium to coarse-grained calcarenite found along most of the coast of WA. Most deposits represent wind-blown shell fragments, with variable amounts of quartz sand, which accumulated as coastal sand dunes during the Pleistocene (Bunting, 2011).

**Telltale**: Monitors movements across cracks. Geotechnical telltales found in Yanchep Cave consist of glass placed across a crack in the limestone—if the glass cracks or snaps, rock movement has occurred.

**Wave-cut platform**: “A long, level surface formed by wave erosion and associated processes. Past wave-cut platforms may be exposed due to sea-level regression” (Bunting, 2011).
Introduction

Scrutinising Very Small Things
Introduction: Scrutinising Very Small Things

Throughout my life, I have had an ongoing obsession with observing and interacting with the tactile materiality of my immediate environment. A seashell’s materiality might be revealed by simply picking it up and rolling it in my hand or by holding it up to my ear, listening and by visually scrutinising the object. The shell may have been found on a beach by accidentally kicking it and hence constructed some kind of meaning or substratum from experiencing and observing my everyday world.

Substratum

At the age of eight, I dug a hole into the soil of the Mendip Hills in England and extracted a fossilised seashell. I held this shell in my hand and asked myself, ‘Why is this ancient seashell embedded in clay in an English hill?’ The sea is far away—miles to the west of the Mendip Hills, where I grew up. The Mendip Hills are located in Somerset in the United Kingdom (UK). These hills are geologically formed from carboniferous limestone.

My childhood memories are full of the experiences of these limestone hills and are saturated with my father’s fascination with the Mendip Hills geology. His fascination developed from exploring the local Mendip limestone caves. He also had a scientific interest in alchemy and the fundamentals of anatomy, which informed his occupation as a dental surgeon. My father’s dentistry in turn began to influence me.
When I visited his dental practice, the smell of pink dental wax and plaster of Paris lingered in the dental workshop. In this workshop, I was surrounded by false teeth, moulds, copies, models, casts, mixing powder, and x-rays. Ivan, the dental technician, a formidable man in a white lab coat, instructed me on how to mix plaster of Paris to the correct consistency in a rubber bowl using a palette knife. The dental workshop was filled with exciting smells, materials and tools. Through observing and experiencing the materiality of this dental paraphernalia, I began to develop a fascination with science. A similar collection of objects to that used in my father’s dental practice was also found at home—my father shared his fascination for the scientific use of his tools of trade.

My home contained many objects and materials that could be described as scientific. A sample of the chemical element mercury lay in a plastic capsule stored in my father’s desk draw. Mercury, an amalgam used at the time for dental restoration, is a poisonous chemical element that cannot be broken down. I occasionally tipped the mercury out onto a glass slab to observe its unique quicksilver property. The magical liquid substance fascinated me as it separated in globules and then reformed as one igneous whole. Mercury is highly poisonous. My father instilled the acute danger of mercury’s toxicity for me: “Do not, never ever, touch—if you eat the mercury you will die!” The mercury was always returned to the top right-hand desk draw in my father’s home office. Although I knew I should not be observing the mercury sample by myself, I often did—observing its magical materiality was immensely appealing.

I inherited my inquisitive nature from my father. He introduced me to the idea of closely observing aspects of my immediate, everyday world. One day, when I was very small, perhaps five-years old, I returned home to find a dissected dormouse on the kitchen table. The dormouse lay pinned out onto a cork dissection board.
My father encouraged me to look closely at the anatomy of the fleshy interior. I remember this moment being key to me developing a quality that I hold most dear in my life: awareness of the value of the close scrutiny of my everyday world.

The purpose of describing these experiences is to illuminate the essences of my childhood world. The embodied knowledge I gained through geology (of place and space), dentistry and chemistry (of materials and processes) has positioned my ontological perspective for this research. Many years after these initial profound experiences with my surroundings, I immigrated to Australia and left behind my childhood experiences of the Mendip Hills limestone, caves, mud, and fossilised shells.

Stratum

So, where am I now? I asked this question when I arrived in Western Australia (WA), where the light is so strong in comparison to the dreary light in the UK. The visible edge of rocks in the Australian landscape appeared sharp against the skyline. Another prominent feature of the Australian landscape that I experienced on my arrival was the limestone cliffs forming Cape Leeuwin in WA. Strange-looking pipes emerged from this landscape. I assumed that I stood on an ancient coral bed, located far from the sea. I then discovered that these pipes were fossilised roots known as ‘rhizoliths’ (Bunting, Watkins & Vartesi, 2014), and I was subsequently astonished to discover that Charles Darwin had also viewed similar rhizoliths when at Bald Head, WA in 1836 (Armstrong, 1985). Darwin stated “I was unable, before touching them, to say whether they were the actual roots of bushes or calcareous models imitating such forms” (as cited in Armstrong, 1985, p. 47).
I also observed trees in the forests of Walpole (WA) bleeding a deep-red resin that was oozing out of their trunks. Rhizoliths and tree resin were visual indications that registered for me—I had undoubtedly arrived in a very different environment. However, I also found echoes of my former life in this new landscape; the limestone and geological structures that I was seeing were familiar to me. As I clambered cliffs and descended into caves, I paid attention to very small things and discoveries that were significant to my printmaking practice. Phenomenological philosopher Maurice Merleau-Ponty’s (2002) notion of the lived body—as our own body interacting both in and with the world—enabled me to consider my approach to observing the limestone geology that became so important to developing the questions for this research. I subconsciously sought a new foundation for my own sense of place; perhaps I could find a place to firmly ground my feet. For environmental scholar George Seddon (1972), this thought-provoking term ‘sense of place’ signifies the subtle importance of imbedded experience and familiarity when identifying with a certain physical landscape. For me, the unique experience of my childhood had developed my sense of place related to the limestone landscape of the Mendip Hills, which had been disrupted by migrating across continents.

This migratory disruption furthered questions in my arts practice. I had, up to this point worked with traditional printmaking techniques. As an artist, I had arrived in this new environment with a high level of contemporary printmaking skills (e.g., nitric and non-toxic etching, relief, silkscreen, and lithographic printmaking), as well as a research interest in the traditional alchemy of printmaking. I now questioned what kinds of processes were available to me to develop ideas around difference in relation to the manner in which a certain reliance on digital technologies was seemly affecting the essence of interpretation of observations of my immediate surroundings. First, I had to ground the disorientation I felt after migrating to Australia. Initially, I was surprised by my immediate connection to the local
WA limestone. This connection was initiated by my experience of viewing the limestone cliffs south of Perth at Cape Leeuwin and at Point Peron. My ability to develop a sense of place at this time relied on geology, and it was limestone geologies that became the key.

In my mind’s eye, I made comparisons between the limestone geology in WA and in the limestone geology I had experienced in the UK. The micro components of the Tamala and carboniferous limestone are similar. The limestone in both locations was formed by the action of water gluing calcium carbonate sediments together. Both locations have cave systems carved out of the limestone through the action of acidic water. Visual differences occur between the limestone at Point Peron, the Yanchep National Park (WA) and the limestone of the Mendip Hills (UK) due to the process by which the limestone was formed. The term ‘aeolian’ refers to the process that formed the Tamala limestone, causing particles of wind-blown sand to form huge sand dunes before these dunes were cemented together by water. The Tamala limestone is a rich sandy colour and grainy in appearance. The limestone in the Mendip Hills was formed under the sea from marine deposits of shells (calcium carbonate) that broke down over thousands of years. It has the appearance of a greyish blue colour. Tiny fossilised shells embedded in the carboniferous limestone structure are visible to the naked eye. I made mental comparisons between the two geological locations in my attempt to shape and secure my perceptions that would ground me in my new environment. Seddon (1972) talks about his fascination in Perth’s environment, and states that the “interest of the landscape around Perth comes from very small things” (p. xiv). When Seddon arrived in Perth (WA), he discovered an unnerving lack of familiarity. It was only through paying attention and developing “the ability to see what was there” (Seddon, 1972, p. xv) that his sense of place was gradually established. Seddon’s notion of taking note of very small things in his immediate environment resonates with the lessons I learnt in childhood.
Immersing Myself in My Surroundings

The only way I was going to be able to develop a body of work that began to draw on printmaking processes was through immersing myself in my surroundings and combining lived experience with reflective engagement through my creative practice. Only by doing this could I ask how experiential relationships with the world contrast with the digital representations of the world. I asked myself: ‘Which printmaking processes would be closest to my lived experience of places and objects?’ The question I brought with me to Australia was; what might be gained and what might be lost if traditional approaches to etching were abandoned and replaced with wholly digital representations? At this time, the foundation of my printmaking practice was in the midst of undergoing a paradigmatic shift in being challenged by the developments in digital and non-toxic printmaking alternatives. As I processed these changes, my challenge was to either ignore digital developments in printmaking or transition to the digital in my own practice. The period in question (1990–2010) was one of rapid and unprecedented change in the printmaking field, with developing digital technologies influencing traditional printmaking practice.

During this time art schools in the UK were required to defend the need for retaining printmaking processes and studios (Hoskins, 2015). Traditional methods of print production that were deemed toxic came to be considered outmoded and print studios (University of Central Lancashire, 2013) were replacing nitric-acid etching with non-toxic alternatives that also gave rise to the development of safer etching mordents and photoetching techniques. These techniques were informed by the research of printmakers Keith Howard, Cedric Green, Nik Semenoff and Friedhard Kiekeben’s work on new non-toxic etching techniques, which has been influential in my decision to align the term toxic specifically with traditional
nitric acid etching processes throughout the exegesis. The term non-toxic alludes to Saline Sulphate etching that is employed as an alternative to toxic nitric acid etching and non-toxic Sodium Carbonate that is used to remove the photopolymer ImageOn film in photoetching. This alignment of the term non-toxic to the mordents used for developing a photographic etching plate acknowledges that a digital positive is used in transferring the image onto the etching plate. In conducting this research, I acknowledge that a degree of crossover occurs in aligning non-toxic printmaking with digital printmaking\(^1\). During this period of rapid change in etching techniques, it was also thought that new digital computer technologies would supersede traditional approaches to printmaking and that old-fashioned methods such as etching were toxic and required too much studio space. To address this issue, printmaker and academic Stephen Hoskins founded the International Multi-disciplinary Printmaking, Artists, Concepts and Techniques (IMPACT) conference in 1999. Hoskins was responding to the demise of traditional printmaking processes and facilities in the UK by promoting an international forum through which to discuss all things relevant to printmaking. I thought the traditional etching process still had a great deal to express about my lived experience. Moving towards a hybrid expression, where one printmaking process would be married with another was one possible solution. Two leading researchers in Post–digital printmaking Paul Catanese and Angela Geary (2012) identified a significant component in post-digital printmaking as “its fundamental integration with traditional analogue plate and press transfer techniques, which therefore expands the core medium of fine art printmaking by exploiting contemporary technologies while retaining an innate communality with traditional ones” (p. 9).

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\(^1\) The crossover in terms occurs because of the nuances associated with different photo-etching techniques. Approaches do not necessarily rely on transferring a digital positive onto the photopolymer film. The image can be a hand drawn positive exposed directly onto the plate without any prior Photoshop manipulation. A position in viewing contemporary 3D print as a non-toxic printmaking process throughout this exegesis formed in relation to the development of my studio practice at a time when the toxic nature of the *Xanthorrhoea preissii* resin employed in the studio was questionable. The depth of argument that a 3D print might employ toxic materials—in the plastic filament that a 3D printer extrudes to build up a form—lies outside the scope of this research. In light of these rapid developments in printmaking techniques the term ‘non-toxic’ positioned alongside the term ‘digital’, was intentional for the purpose of this research.
For Catanese and Geary (2012) “objects created through these processes are in themselves prints, in the sense that they are multiply produced objects” (p. 47). Could adopting these contemporary technologies, including three-dimensional (3D) print processes, somehow lead to creating richer artworks that could explore my lived experience? Hoskins’ (2013) informed my experimental 3D printing in my creative-arts practice with the notion that the “most innovative [3D print] work occurs when the images created use the technology as a means to an end” (p. 78). 3D print technologies that are employed for scientific uses in data visualisation, physical format modelling, and geological, medical and archaeological roles, are of particular intrigue. One objective in this research has been to implement 3D print technology as a tool, which might enhance observation and encourage experimentation in creative practice. With my decision to research in limestone caves I choose to mediate the physical world by using these tools of science and to examine the possible benefits of immersion for the creation of new works.

To examine differences in which a certain reliance on digital technologies was seemly affecting the essence of interpretative observations in my immediate physical surroundings I anticipated merging digital two-dimensional (2D) and three-dimensional (3D) print technologies with traditional printmaking practice. I intended to develop a body of work that drew on traditional and digital printmaking processes while immersing myself in my surroundings—specifically in limestone caves—and combining lived experience with reflective engagement through my creative practice. Only by doing this could I ask how experiential relationships with the world contrasted with the digital representations of the real world.
Aligning Observations to the Real World

My interest in examining traditional and digital printmaking lies in constructing images derived from the original object and momentarily stepping away from the digital to intensively observe the physical world. It is also important how I attempt to translate my experiences. The processes I employ in this attempt to depict such lived experiences and everyday realities in trying to somehow embody a kind of *materiality of vision* in opposition to the notion that the digital aesthetic has taken over the rendering of many visual images that infuse the contemporary world.

With the initial impact of digital technology affecting analogue processes the term ‘digital aesthetic’ emerged (Meigh-Andrews, 2006) and has been integrated into the arts lexicon. Video artist and scholar Christopher Meigh-Andrews (2006) noted that video was resilient to digital technology but both media were “opening up the rich and complex territory between perception and participation, between the actual and the virtual, between the moving and the static, between technology and art” (p. 337). The digital aesthetic crossed over into printmaking, in line with the development of computer technologies (Coldwell, 2001, 2008). Digital technologies are adopted by printmakers the world over, as the “history and development of printmaking is inextricably linked to the spread of ideas and records the way the world has been perceived by artists” (Coldwell, 2010, p. 5). Digital technologies have become integrated into everyday life to such a degree digitalisation of images may no longer represent an innovative tool for printmakers, as post-digital printmaking gives way to the rapidly expanding integration of digital technologies into image making. An example in the contemporary world is the iPhone, and the associated mobile application software or ‘apps’ for capturing images.
Capturing Digital Images from the Real World

A defining moment occurred in creating a conceptual framework for this research when I realised the ease at which the Autodesk iPhone 123D Catch app technology (Video: 1) could capture an image taken from a specimen of *Xanthorrhoea preissii* grasstree leaves and reconstruct those 2D images into a 3D image. The computer software created a 3D image by digitally stitching together photographs taken with the iPhone. Viewing the *Xanthorrhoea preissii* leaves in 3D from any angle on my touch screen iPhone was insightful. I wondered how this delimited my observation of the original object as I marvelled at the allure of the digital reproduction on the screen.

Video 1: Robinson (2014), *Experimental iPhone Photogrammetry Sequence, Xanthorrhoea preissii* resin leaves, iPhone. Film Editor: Sarah Robinson.
Capturing this digital data from the *Xanthorrhoea preissii* grasstree reminded me of visual culture theorist Nicholas Mirzoeff’s (1998) notion of a ‘digital gaze’ (p. 11), which he describes as a “simultaneous display and interaction of a variety of modes of visuality” (p. 3). I was captivated by this image. The effect was so strong that it led me to ask the following question—if digitalisation continues to dominate contemporary image making, how might it affect our interpretations of what is being observed? Mirzoeff (1998) proposes that we are learning how to see like computers because documentation of our lives and ourselves is created through overlapping digital gazes created by digital technologies; he states that the result of this overlapping is the “boundaries of the visual subject are under erasure from within and without” (p. 11). Digital culture scholar Rose Woodcock (2013) focuses on notions of image absence and presence that aligns with Mirzoeff’s (1988) notion of visual boundaries between images being digitally erased, through her exploration of vision’s *materiality* within virtual reality. According to Woodcock (2013), value is placed in our innate perceptual system of seeing as a way of explaining the definitions of virtual experience that seemingly rely on the justification that the simulated environments are a reality. Experiencing virtual environments relies on empowering normal vision, as Woodcock suggests we “think about the ‘practice’ of vision, and consider on what basis vision can have its own ‘materiality’” (2013, p. 171). Woodcock (2013) acknowledges vision as an instrument; the perceptual experiences of the lived body through innate human vision in that the “formulation of a theory of perception should begin by understanding the nature of the visible, external environment in which the perceiver is immersed” (p. 172).
The definitions of vision as a material practice explained through the work of Mirzoeff (1998), Woodcock (2013) and psychologist James Jerome Gibson (1947, 2015)—who was intrigued by research into the field of visual perception—are important to my work because they reinforce the benefits of coming back to the act of seeing, the thoughtful observation of our surroundings. As Gibson (2015) states, “natural vision depends on eyes in the head on a body supported by the ground, the brain being only the central organ of a complete visual system” (p. xiii). I choose to enter limestone caves, an active intervention of immersion for creative practice to consider “how the perceptual system encounters its worlds (reality)” (Woodcock, 2013, p. 173) and to understand the “external environment in which the perceiver is immersed” (Woodcock, 2013, p. 172). Through the practice of entering limestone caves, the object of my attention and my cognition was altered through perception.

The extrapolation here is that “the greater amount of ‘watching’, the greater the observer’s influence on what actually takes place” (Weizmann Institute of Science, 1998, para. 2). This notion of greater watching draws on quantum theory: “by the very act of watching, the observer affects the observed reality” (Weizmann Institute of Science, 1998, summary); a concept fundamental to quantum physics which was revealed in an experiment conducted at the Weizmann Institute of Science, which demonstrated how a stream of electrons was affected by “the act of being observed” (Weizmann Institute of Science, 1998, para. 2). I was intrigued by the idea that greater watching could affect the reality of the cave surrounding me. In the Weizmann Institute of Science the observer was a technology designed to detect minuscule electrons passing through small holes. The technology in the form of an electron detector had a capacity for ‘observation’ of the moving electrons, to be increased or decreased. It became apparent to the scientific researchers Eyal Buks, Ralph Schuster, Mordehai Heiblum, Diana Mahalu and Vladimir Umansky, (1998) that interference—interference being when electrons behave like waves as they passed
simultaneously through more than one opening in a barrier to meet again on the other side of the barrier—could “only happen when no one was watching” (Weizmann Institute of Science, 1998, para. 5) because “when under observation, electrons are being forced to behave like particles [matter] and not like waves. Thus the mere act of observation affects the experimental findings” (Weizmann Institute of Science, 1998, para. 5). This process concluded that as a beam of electrons travel, they change from a particle (matter) to a waveform. The Weizmann (1998) experiment concluded, “observation tends to kill interference” (para. 5). If greater observation contributed to this lack of interference it suggested that the electrons travelled in waveform, a phenomenon perceived in our consciousness alone; however, the individual electron particles returned to physical matter. This notion is reminiscent of philosopher Jan Westerhoff’s (2011) description of a similar experiment, which examined the point at which an object switches from being a probability wave, with its potential existence smeared out across space, to becoming a spatially localised object in the form of an airy pattern.

An airy pattern is formed by a series of concentric rings resulting from light being diffused through a circular aperture. Westerhoff (2011) accepts that this experiment is crucially important to understanding whether matter is real. He posits that interpretations of the real as matter are possibly conceptually wrapped up in consciousness, implied by the example of the electron wave residing in one’s consciousness because one cannot physically see the electron in the experiment (Westerhoff, 2011). This idea of airy patterns, which Westerhoff uses as an example to explain notions of reality, influenced the work Airy Vision (Robinson, 2015a) (Figure: 78, p.169). The Weizmann experiment and Westerhoff’s interpretations of airy patterns rely on technologies to see but the significance of such concepts inform my understanding of the everyday world as intensely relational—what I think about my surroundings and how I look at and engage with my surroundings is important.
Grounding a Conceptual Framework

This research shares an affinity with artists and theorists who interrogate experiential relations to the world by acknowledging or implementing digital technologies in their creative practice. Seminal artists that have influenced this research include Sigmar Polke (2014) for whom the analogue half-tone dot is significantly positioned in his work as an example of the impact of technologies on printmaking before the digital turn and Marc Quinn’s (2015c) work with new 3D print technologies that he employs to question experiential relations. To a lesser extent the significance of the contemporary work of Flora Parrott (2012) and Alessa Tinne (2011) lies in their investigation into contemporary 3D print that conceptualised digital scanning as seeing. I employed a traditional etching by Rembrandt van Rijn’s (1650b), The Shell (Conus marmoreus) (hereafter, The Shell) to conduct a pivotal case study that traces a continuum from the original to the copy.

Continuum

Rembrandt’s, The Shell was used as a case study to:

i. trace the history of printmaking from traditional toxic etching techniques to contemporary digital printmaking.

ii. draw connections between aesthetic and technical differences between toxic and non-toxic etchings/photoetchings.

iii. provide a continuum from the original to the copy.

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2 The British Museum, London, state that Rembrandt is also known as Rembrandt; Rembrandt Harmensz van Rijn; Rijn, Rembrandt van. Thereafter as convention dictates he will be referred to as Rembrandt throughout the exegesis. http://www.britishmuseum.org/research/search_the_collection_database/term_details.aspx?bioid=110150.
This pivotal case study allows the complexity of the relationship to be drawn between the infiltrations of digital technologies into printmaking techniques that seemed to be undermining the intrinsic value that I placed on traditional etching skills. The digital turn was affecting printmaking because it provided new ways to manipulate images to create photopositives for translation in printmaking’s hybrid processes. The term ‘digital turn’ (Mills, 2010) is derived from literary research, and is used to describe “a consequence of globalization and the growing range of technologies for communication” (p. 231). The digital turn was effecting the value that I assigned to the quality of etched line and aesthetic resonance determined by skill. The digital turn was disrupting my work, which had previously relied on acquiring etching skills and developing a way of seeing that operated with this process. Specialist training in etching relied on developing studio processes alongside expert technical skills and material understanding but I found myself asking how the non-toxic etching methods compared to the qualities innate in etching practice. Digital and non-toxic techniques were inevitably brought into my practice through the process of photoetching. I became intrigued how the influence of digital techniques in my practice could develop from seeking simplistic visual differences between toxic and non-toxic etching to questioning my perception of the materiality of printmaking—the inks, chemicals, paper and resin used in my practice was clear but what is the materiality of implementing a pixel? What would a continuum from traditional toxic etching techniques to contemporary digital printmaking look like? I used Rembrandt’s *The Shell* as a case study to explore these questions.
Grounding a Theoretical Framework

Influential theorists such as Gilles Deleuze (1983) and Brian Massumi (1987) theoretically supported my analysis of Rembrandt’s *The Shell* print in terms of defining the original and copy because they too questioned representations of the world that drew on cultural theorist Jean Baudrillard’s (1994) concept of simulacra.

Close observations of small things theoretically engaged with Merleau-Ponty (2014), who asserted that we interact with and in the world though a *lived-body experience*—a phenomenological engagement that embraces the materiality of vision in that the “visual experience itself is powered by ordinary human vision” (as cited in Woodcock, 2013, p. 171). For this research, handling printmaking materials, technologies, and objects describe a “specific sort of knowing, a knowing that arises through handling materials in practice . . . a very specific way of understanding the world” (Bolt, 2010, p. 29), which visual media researcher Barbara Bolt (2004) terms ‘materialising practices’ (p. 166).

We use tools to engage and record aspects of our world, which change as technologies change. How might differences in perceptions be enhanced or devalued with the changes brought about by digital tools? Does digitalisation change the way we navigate our sense of place or influence the sites that we embody? In what ways are our perceptions of the world changing in the rapidly moving world of technology?
Aim

The aim of this PhD was to produce a body of contemporary artwork that explores the possibilities for traditional etching, contemporary digital 3D print and non-toxic printing with the intention of examining how the onset of digital imagining techniques has changed the broader printmaking field. This project is also about the copy. Rembrandt’s ‘The Shell’ is employed as a pivotal case study for examining differences between the original and the copy. The aim of the exhibition: Imperceptible Realities was designed as a platform to test 3D print technologies to push the artworks into unfamiliar territories with 2D and 3D prints on various material grounds emerging through traditional and digital means. This investigation aimed to present the research outputs in two parts: an exhibition: Imperceptible Realities and an exegesis: Digitalisation: Re-imaging the Real beyond notions of the original and the copy in Contemporary Printmaking.
Significance

The significance of this research lies in its contribution to contemporary debates surrounding the notion that connects traditional methods of etching to the impact of digital technologies and non-toxic processes in etching traditions. The connection between digital and traditional printmaking are hybridised through technical process. In an attempt to understand this notion of hybridity further, this research engaged with newer 3D technologies that affect printmaking. Printmaking survives because its processes are reinvented, amalgamated and redistributed in hybrid forms. This research offers a space in which creative outcomes move away from the hybridisation of printmaking techniques and begin to question the digital relationship in printmaking with advancements in 3D print technologies.
Research Questions

The following research questions inform this study:

1. What is gained and what is lost through the increased uptake of digital technologies in printmaking?
   a. How might experiential relationships to the world contrast to digital representations of it?
   b. To what extent has digital visualisation become divisive in viewing the world?
   c. By examining traditional and digital printmaking, how might the notion of a digital aesthetic assist or restrict our visualisation of the physical world?

2. What effect might a practice-led research approach that focuses on visual differences between the original and the copy have on producing a body of contemporary artwork that asks how our perceptions are changing with the onset of digital technologies?
Outline of Chapters

**Chapter One Perceptual Blinding:** The focus of this chapter identifies methodologies adopted for constructing a conceptual and theoretical framework for this research by integrating several approaches to examine differences in observations of the world through traditional and digital mechanisms. The chapter examines the motivations for adopting practice-led research (PLR) as the overarching methodology for this creative enquiry through the work of art theorist Graeme Sullivan (2010, 2011) and Professor of theory of research in the arts, Henk Borgdorff (2011). Both academics are employed to assist in navigating through the structure of my practice-led research framework by examining reflectivity in practice, predominantly because a PLR method for research is process driven. Performance practice scholar David Fenton’s (2012) notion of reflecting *in* and *through* action is employed as an innovative research design for investigating creative practice.

Former rector of the Royal College of Art, Christopher John Frayling’s (1994) extensive critique into the nature of an artist as a creative researcher influenced my methodology in terms of the technologies and processes implemented for this research. Frayling’s proposition of categorising methods for research under the heading: *for, into,* and *through* practice is adopted for convenience and clarity.
In **Chapter Two** *Observing and Recording Very Small Things* I ask how experiential relationships to the world contrast to digital representations of the world. I present this discussion alongside a case study that scrutinises Rembrandt’s (1650b, 1650d, 1650e) etching *The Shell States I & II & III*. This chapter compares and contrasts different states of these prints from a technical and aesthetic viewpoint. Here the ancient concept of *squaring the circle* is uncovered and is proposed as a device for conceptualising my research. The concept of Baudrillard’s (1994) simulacra, which undermines distinctions between copy and model, is applied to the analysis of Rembrandt’s etching.

**Chapter Three** *Positioning Creative Practice in Visual Culture* introduces the digitalised world through the work of Woodcock (2013) and Mirzoeff (1998). The work of the key theorists Deleuze (1983) and Massumi (1987), who analyse and theoretically extend Baudrillard’s (1994) philosophies on simulacra, are examined through the example of the newer copies of the original Lascaux cave Conseil départemental de la Dordogne (2014), Lascaux II, III and IV.

**Chapter Four** *Mediating the Physical World Using Tools of Science*: Explores the influence of the digital aesthetic on my printmaking practice, tracing the onset of digital technologies and non-toxic printmaking alternatives. Through an embodied relationship with the world, this chapter examines a phenomenological perspective as I posit how an immersive experience in a cave studio was fundamental in altering my perceptions.

**Chapter Five** *The Confoundedness of Being in a Fractal World* examines my research outcomes manifested in 2D and 3D works for the exhibitions *Eyes Open (i): Drawing in the Dark* (Robinson, 2014i) and *Imperceptible Realities* (Robinson, 2015t). The effects of digitised visions are examined through two specific works where the presence of the circle serves as a reminder that the circular lens has been superseded by the square pixel.
Chapter One

Perceptual Blinding
Chapter One: Perceptual Blinding

Introduction

This chapter examines why practice-led research was the appropriate methodological framework for conducting this study. This discussion of practice-led research is followed by an outline of research into, for and through (Frayling, 1994; Webb, 2008, 2013) practice. These terms are applied to distinct strands of historical, material and collaborative methodologies for this practice-led research. The final section of this chapter examines the impact of adopting a collaborative multidisciplinary approach for creative practice, through a particular collaboration drawn between a hydrologist, a Commonwealth Scientific and Industrial Research Organisation (CSIRO) data analyst and myself.

Practice-led research inverts the scientific logic of finding truths for understanding the world because it uses ideas or unknown content first, rather than starting with the known, to construct new meaning (Sullivan, 2009, p. 48). Borgdorff (2011) states that exploration into the production of knowledge through creative research stresses open-ended and unfinished thinking recognising that “knowledge and experience are constituted only in and through practices, actions and interactions” (p. 47). For this research, actions and interactions occurred in different fieldwork sites, between different collaborative practices, and in a cave and traditional studio through interactions with materials and ideas.

Practice-led research is “the systematic, analytical, reflective gathering and analysis of material that is directed to . . . answering a question”, (Webb as cited in Smith & Dean, 2009, p. 16). I realised through my printmaking practice that experimentation with the materials of printmaking could produce a “specific sort of knowing, a knowing that arises
through handling materials in practice” (Barrett & Bolt, 2007, p. 29) in relation to examining differences between traditional and digital techniques. In my research, “[r]eflective gathering and analysis of material” (Webb, 2008, p. 17) occurred through forming iterative cycles (Smith & Dean, 2009, p. 10). I selected methods of research drawn from unfamiliar areas to initiate “projects from other entry points to it [my research] than those they [researcher-practitioners] normally engage with” (Smith & Dean, 2009, p. 24). Practice-led research is a process-driven approach in which the subjective emerges from practice, developing the concept under examination in and through action. Bolt (2010) recognises that knowledge occurs through the artist’s interaction directly with materials of practice which creative communications scholar Hazel Smith and sonic communications scholar Roger T. Dean recognise, as “the transmission of technical possibilities through increased understanding of method and practice is potentially one of the most valuable outcomes of the rise of practice-led research” (2009, p. 24). Practice-led research aligns to the way I navigate my world—I observe very small things through creative practice to question my ontological and epistemological understanding of the world.

Practice-led research encompasses the notion that creative practice can drive research. Smith and Dean (2009) define practice-led research as “referring both to the work of art as a form of research and to the creation of the work as generating research insights which might then be documented, theorised and generalised,” (p. 7). It is reassuring that Smith and Dean (2009) note the importance of acknowledging “non-verbal forms of [knowledge] transmission . . . that knowledge itself is often unstable, ambiguous and multidimensional” (p. 3). Practice-led research used a multi-method approach (Haseman, 2006). Methods that drove this research were:

- Immersion in practice
- Research for, into and through practice
Immersion in practice

In adopting the research method of immersion, I planned to enter the cave in consideration of the notion of ‘data creation’ versus ‘data collection’ (Sullivan, 2009, p. 50). I entered the cave as “a stepping off point for creative imagination” (Sullivan, 2009, p. 50), and had no preconceived ideas of how to “make use of multiple ways of giving form to thought” (Sullivan, 2009, p. 50). The concept of data creation plays a central role in the importance that I place on immersive experience as a research method. My objective was to avoid merely collecting information. My printmaking practice is a predominant method for potentially creating knowledge that can be “translated into interpretive forms” (Sullivan, 2009, p. 50) and multiple ways of embodied meaning. There has been a notable shift in contemporary creative practice that acknowledges that tacit knowledge can unfold in the artist’s studio practice. Tacit knowledge or knowing theorises the indescribable—the awareness in practice of things that defy implicit interrogation and are “highly personal and context specific and deeply rooted in individual experiences, ideas, values, and emotions” (Gourlay, 2002, p. 2). Bolt (2004) draws on philosopher Martin Heidegger’s (1977) techne to interpret the way we understand the world by handling materials and tools before constructing theories in response to the manipulation of materials.

Working from the unknown or pre-reflective by entering the cave was crucial to this research because I habitually work using an experimental approach. Without experimentation, potential directions in the creative practice would not occur. Visual culture studies academic David Prescott-Steed’s (2007) examination of the intersections of praxis notes the “notion of leaping into the ‘unknown’, framed as a requirement of creative thinking, means that praxis always involves a certain degree of risk” (pp. 3–4). Taking a risk shaped my practice-led research as I chose to follow a trajectory that did not rely on what I
already know I could creatively produce. I asked myself how in a contemporary world infused with digitalised images might these subterranean experiences form insights into notions of observing the physical world.

Notions of the pre-reflective, reflective and collaborative practice were developed using three methods: archival research (reading, observing, collecting), field research and a pivotal case study contribute to gaining new understandings within my creative practice. I engaged with phenomenological and reflective methodologies that were influenced by Borgdorff’s (2011) interpretation of the artistic researcher’s role in knowledge production; not only “to provide a specific articulation of the pre-reflective, non-conceptual content of art [but also to investigate] unfinished thinking” (p. 44) in some way. Borgdorff implies that this space of unfinished thinking is where the site of artistic research lies.

Frayling (1994) devised for, into, and through research in creative practice as a structure for defining arts practice—terms developed to support art and design research—that “grew out of, what we actually do” (Frayling, 1994, p. 5) as artists. Frayling (1994) and cultural theorist Jen Webb (2008, 2013), whose research into creative production, both acknowledge a degree of boundary crossover between the three categories for, into, and through practice. This crossover is extremely productive when applied to collaborative practice.

Research for Practice

Frayling (1994) notes research for art and design is:

[w]here the end product is an artefact - where the thinking is, so to speak, embodied in the artefact, where the goal is not primarily communicable knowledge in the sense of verbal communication, but in the sense of visual iconic or imagistic communication (p. 5).
Research for practice acts as a rigorous tool for contextualising my research and positioning its origins. This concept of research for practice generates data that contextualises the knowledge within my research-design framework and establishes circumstances relevant for my practice to begin gathering reference materials. The following are the methods used in my research for practice:

i. archival research (observing, reading, and collecting)
ii. field research (at Point Peron, Crystal Cave, Yonderup Cave, Secret Harbour Beach in WA and Wookey Hole Caves in the UK)
iii. case studies of Rembrandt’s *The Shell* and the Crangonyctoid amphipod (examined in depth in Chapter Two)

Archival Research

I searched archival material related to the geological history of the Wookey Hole Caves (UK) at the Wells Museum in the UK. The archival evidence contextualised my research through reading and observing geological specimens to enhance my understanding of the Mendip Hills limestone geologies in which the Wookey Hole caves system lies. I was surprised to ascertain that the main entrance to the Wookey Hole Caves (UK) lies in Dolomitic Conglomerate rock before the cave system eventually extends into carboniferous limestone.

Further archival research was initiated by observations of *Xanthorrhoea preissii* resin native grass trees found outside Crystal Cave (WA). I experimented with the resin in the studio. One historical use of *Xanthorrhoea preissii* resin use can be traced back to Henry A. Gardner (1946), who experimented with bizarre notions of buoyancy by using *Xanthorrhoea*
preissii resin to fill nautical buoyancy floats. While Fiona Bradshaw (2013) analysed ethnographic museum specimens—that incorporated resin from six different species, including Xanthorrhoea resinosa Pers—used as a material for adhesives, medicine and narcotics—to determine the chemical characterisation of the resin.

Archival research was also conducted on Rembrandt’s (1650b, 1650d, 1650e) etching The Shell States I, II and III. I undertook a case study through a process of photography, sketching and note taking while observing Rembrandt’s (1650b) The Shell print at the British Museum. This approach in examining traditional etching methods reflected my own etching skills honed by specialist training that relied on hand–eye–mind coordination. The decision for undertaking this case study of Rembrandt’s print was suggested to me by investigations in my practice as I adopted non-toxic alternatives for etching. I considered which method—toxic or non-toxic—gave the most aesthetically pleasing line.

I asked myself what the term toxic actually means. Securing expert chemical advice from the Separation Science and Metabolomics Laboratory (personal communication, Bong & Gummer, 10 June 2014) determined that a problem lay with the term non-toxic because everything has potential toxicity in certain volumes. Concerns of toxicity in printmaking had catapulted the printmaking community into conducting research to find alternative etching mordents and grounds. The attention paid to developing non-toxic etching alternatives in the printmaking field was sufficiently intriguing to influence my studio practice from 1999 onwards. An inkjet print digitally printed over traditional etching forced new thinking for my practice in 1999 when I was employed as a senior printmaking technician and Artlab course leader at the University of Central Lancashire. I asked: what would happen if I ignored the pitted, inferior etched line achieved with non-toxic grounds? Could non-toxic methods compare to the aesthetic qualities innate in my etching practice at this point? I recognised a connection with the rise of the non-toxic printmaking techniques available that I employed
for photoetching with the digital manipulation possible in creating digital positives for this process. Digital and non-toxic techniques had inevitably combined in my practice through the process of photoetching and continued to form the foundations for this research.

Fieldwork

My fieldwork involved immersive experience within limestone geologies in Crystal Cave and Yonderup Cave in Yanchep National Park (WA) and in Wookey Hole Caves, Somerset (UK). Immersed in a cave environment I anticipated as a space that would lead to a process of reflection in my creative practice. Merleau-Ponty (2002) noted that:

[the] world is always “already there” before reflection begins—as ‘an inalienable presence; and all its efforts are concentrated upon re-achieving a direct and primitive contact with the world, and endowing that contact with philosophical status. (p. 8)

Merleau-Ponty (2002) uses the term ‘facticity’—the notion of the human condition as being central to our subjective experience of the world because the world is “already there” (p. 8). From experiencing the event, there is potential to add value to perceptions of the world through knowledge production for the self through reflecting on the moments of lived experience—the pre-reflective moment that occurs before abstract reflection can occur.

Entering the cave studio offered an experience that informed my creative practice. The cave is and is always already there, as Merleau-Ponty (2002) reminds us when referring to the inalienable presence of the world. Merleau-Ponty (2002) stated, “My adherence to the world
enables me to allow for the variations in the cogito, to favour one cogito at the expense of another and to catch up with the truth of my thinking beyond its appearances” (p. 527). The phenomenologist explains that the process—cogito—implies it is essential to recognise the value of experiencing the world to gain moments of cogito before any reflective analysis can occur from experiencing that world.

After my immersive experience in the cave, through which I gathered research material for my creative practice, I turned my attention to other ways of generating knowledge to deepen my understanding about advances and new opinions regarding digital technologies in the wider context of contemporary printmaking. Frayling (1994) and Webb (2008, 2013) both define research into historical and perceptual perspectives in relation to technical and material processes. To generate knowledge and thinking through my studio process and material practice I examined the printmaking linage (in this case etching) from traditional to contemporary digital techniques.

Research into Practice

Drawing from the notion of research into practice lies at the heart of what I accomplish, what I achieve in my printmaking practice and what keeps me motivated. Webb (2008) notes:

[r]esearch into practice (generating knowledge about techniques, approaches and thinking to do with how practice is carried out in your discipline). Draws on methodologies of practice (sketching; note-taking; photography; drafting and editing; simulations; self-reflection; concept mapping; story boards; flow charts).

(Para. 4)
Drawing on the methodologies of contemporary and traditional printmaking practice entails methods for investigation into my creative practice that connect thoughts orbiting the Crystal Cave Crangonyctoid amphipod’s likely extinction to referencing, through my printmaking practice, the loss of traditional nitric-acid etching to non-toxic alternatives.

The following methods were used to execute my research into practice:

i. historic research (into Rembrandt’s *The Shell* etching and non-toxic printmaking)

ii. reflective practice

3D print has updated traditional techniques of printmaking, and has the ability to reinvent itself in novel ways because printmaking continually keeps up with developments in technologies. This printmaking lineage encompasses the quality of the paper, the quality of the etched line, the smell of the ink, and the alchemy of the process. These characteristics are imbedded and embodied in my printmaking practice, the haptic relationship in manipulating materials though touch.

Historic Research

The following list of materials and etching techniques were used in this research:

- drawing materials: graphite, charcoal, *Xanthorrhoea preissii* resin.
- etching techniques: nitric acid, copper sulphate, saline-sulphate mordents, steel and copper plates, traditional hard and soft grounds, photo-silkscreen, traditional nitric-acid etching on steel plate, plate preparation: toxic wax ground, smoking plates with traditional wax tapers, bitumen stop out, etching ink.
technical and material printmaking processes: photoetching using ImagOn film exposed to ultraviolet light and implementing less-toxic sodium carbonate washout; a non-toxic printmaking process supported by a literature review of the non-toxic printmaking research in the contemporary field from the 1990s onwards.

technology: etching press, Pico pocket projector, digital camera, iPod for cave audio recordings, Adobe Photoshop and Adobe Premiere.

3D print technologies and associated photogrammetry software: iPhone Autodesk 123D Catch app, Meshlab, 3D print using a Romer Absolute Arm with an integrated scanner/Polyworks mesh software and Fortus 250mc printer, Blender, Agisoft PhotoScan, Shapeways online 3D Print Bureau.

Reflective Practice

Educational theorist Morwenna Griffiths (2011), whose empirical investigations into the nature of the self in practice advocates the following on reflective practice:

[Reflective practice is a] means by which to evaluate the influence of a researcher’s values and perspectives...the relational self embedded in time and place, and as becoming what it is not yet...carried out by the self or selves who are found in the thick of it. (p. 184)

For me it is Merleau-Ponty’s (2002) notion of pre-reflectivity that occurs in fieldwork that has a deeper potential to move and reflect in and on research action because without the pre-reflective lived experience, refection is not possible. The pre-reflective is a state of being that
necessities nurturing in its recognition for creative practice. It is important to create a space where reflectivity operates as a method of knowledge production because the research is not only bound to reflective interpretations but also is attached to “our bodily intimacy with the world around us into the foundation of our thinking and acting—*getting a grip on reality*” (Borgdorff, 2011, p. 59). I strove for initiating this research with the *unknown*, or a pre-reflective stage by entering the cave. The pre-reflective positioning in the cave was a conscious decision reliant on knowing that my immersion was an essential fieldwork data-creation tool. A tool implemented before gaining an embodied understanding of the site or making any decisions through the studio process that asked how experiential relationships with the world contrasted to digital representations of the world. Adopting reflectivity as a method for this research activated a process of editing and refining, in and through action. The digital impact on the traditions of printmaking processes became apparent through creative practice during comparative experiments between traditional etching and non-toxic etching alternatives.

**Research *through* Practice**

Frayling (1994) and Webb’s (2008, 2013) ideas about research *through* practice state it employs techniques that are “intentional, deliberate, accessible and creative” (Webb, 2008, p. 2). The following methods were employed as research *through* practice:

i. materials research

ii. collaborative practice

iii. discovery through practice
Materials Research

Establishing a partnership with a chemist was a method employed to generate knowledge about the materiality of Xanthorrhoea preissii resin. Examining alternative non-toxic etching techniques raised the question of which etching acid Rembrandt (1650b) most likely used to attain the aesthetically pleasing lines found in *The Shell*. This paralleled suspicions that other materials utilised in the studio were potentially toxic. Influenced by the development of health concerns in printmaking that gave rise to non-toxic printmaking, specific concerns lay in my use of Xanthorrhoea preissii resin, that the resin might be toxic, when exploring its materiality through studio process.

It became apparent that it was necessary to seek expert chemical advice to help ascertain the best diluent to use to incorporate Xanthorrhoea preissii resin into etching ink. The staff at the Separation Science and Metabolomics Laboratory at Murdoch University (SSML) (WA) agreed to assist me with understanding the properties of Xanthorrhoea preissii resin in relation to its toxicity. Dr Sze How Bong and Dr Joel Gummer provided advice on mixing Xanthorrhoea preissii resin (Figure: 1, p.36) with various chemical agents under controlled conditions. It was agreed with the chemists that considering the potential toxicity of Xanthorrhoea preissii resin, the experiments to ascertain the best diluent for the resin would be conducted at a superficial level tailored to determining the best diluent for the resins use in my practice within the scope of my research. Microscope slides were prepared with samples of the diluted resin to view them at digitally high resolutions. While the use of this resin proved a dead-end in terms of this research project, the relationships formed through the process proved fruitful.
Figure 1: Robinson (2013c), Investigating Xanthorrhoea preissii Resin, Murdoch University Separation Science and Metabolomics Laboratory. Photographer: Sarah Robinson.
Collaborative Practice

The notion of collaborative practice in the arts is often recognised as a multidisciplinary approach that transcends traditional discipline boundaries. For me, the notion of working across disciplines, the “social processes whereby human beings pool their human capital for the objective of producing knowledge” (Bozeman, Fay & Slade, 2013, p. 3) offers a true meaning to collaborative practice. Academic Paul Carter (2004), sees the role of collaboration as referring to the “collisions between the different technes, as well as the resistance to intellectual manipulation of the materials used, mean[ing] that collaboration is always, first of all, an act of dismemberment” (p. 11). This notion of dismemberment is a strategy I chose to employ when working with Marija Jukic (hydrogeologist), and Nick Mortimer (CSIRO data analyst). This relationship explored cross-disciplinary collaborative practice for the exhibition InConversation (Adams, Newman-Storen & Kueh, 2014) as a test for my larger research project.

A conversation commenced with Marija Jukic (hydrogeologist) and Nick Mortimer (CSIRO data analyst). Mortimer introduced me to the Secret Harbour Beach (WA) CSIRO facility, which monitored sea wave movements with six surveillance cameras mounted on a radar tower set in the sand dunes. These surveillance cameras recorded the sea wave patterns at set intervals to monitor the sand movements on the seabed. The digital data from the cameras fed a computer that was housed in the radar tower. The computer scripted the digital data in real time. The six cameras took a picture at the same time, and the data analyst (Mortimer) scripted the time dictated between each six-shot sequence.
Each camera was programmed to filter out specific pixels so that the darkest or lightest pixel was selected. This meant that specific data visualised in the work *The Real Image in Real Time*, (Mortimer and Robinson, 2014 a & b), (Figures: 2 & 3, p.39) caused the three figures (Mortimer, Dan Kelsey-Wilkinson and myself) on the beach to appear as *nothing* when the lightest pixels were selected, but in other images where the darkest pixel was selected the human figures on the beach were visually present (Figures: 2 & 3, p.39). As I walked across the beach, a record was created of my physical presence that was *there* and *not there* at the same time at the precise moment that the images were taken simultaneously at 12.24 pm on 18 March 2014.

I used the method of collaboration to change my practice armed with Borgdorff (2011) warning: “either the scientific research serves or illuminates the art; or the art serves and illuminates what is going on in the science” (p. 53). There are pitfalls for artists to avoid when true collaborative practice begins; as the creative outcomes play neither illustrating nor servicing roles. This dialogic process developed into a concept for the installation work *Scripting Realities* (Figure: 4, p.40). This artwork encouraged the viewer to engage with changing realities.
Chapter One: Perceptual Blinding

Figure 2: Mortimer, Robinson (2014a), *The Real Image in Real Time*, Photograph of Secret Harbour beach taken on 18/03/2014—12.24 pm, Snap/Camera C3. Photographer: Nick Mortimer.

Figure 3: Mortimer, Robinson (2014b), *The Real Image in Real Time*, Photograph of Secret Harbour beach taken on 18/03/2014—12.24 pm, Timex/Camera 3. Photographer: Nick Mortimer.
Figure 4: Mortimer, Jukic, Robinson (2014), *Scripting Realities*, installation, non-toxic photoetchings, digital prints, radar tower camera, sculpted fish and dogs, plastic aquarium plants. Photographer: Ian Yendell.
Through experimentation, analyses of differences in observing things in the world affected by the pixel blocking, blurring and filtering data captured on film was explored through practice. Collaborative practice acknowledged a multidisciplinary method for gaining a deeper understanding of the influence of digital aesthetics on images that represent the world. Collaboration opened up different ways of thinking by the back and forth rhetoric between disciplines. I continued to be influenced by innovative approaches; openness and discovery learnt from this collaborative experience, and these approaches benefited the development of my proceeding creative works. The *Scripting Realities* (Robinson et al., 2014) installation generated an innovative approach informed by my understandings of how the computer controlled the camera and scripted vision.

**Discovery through Practice**

Frayling stated in 1994 “the *process* of discovering has been virtually ignored until recently, [which is] why the activity of fine art is of increasing interest to the historians of science” (p. 3). I was influenced by this idea when attending a Simpleware 3D image-visualising software workshop. Simpleware technology can generate models from inputted data to visualise and analyse in a 3D environment. I observed a medical technician reconstructing a new custom-fit jawbone replacement digitally designed on screen to fit the anatomy using imported scans from the patient. I could see the awkwardness in the computers digital rendering of the jaw replacement. I imagined the correct proportion necessary to improve the design honed from years of drawing and analysing the human figure from observation. Technologies have progressed far beyond the unaided human eye; however, this reconstruction of a jawbone within the inputted data from the patient indicates there may be an alternative approach that amalgamates digital and traditional skills.
One approach in recognising digital and traditional skills drew on my physical and conceptual removal from the cave, which changed my positioning towards “getting a grip on reality” (Borgdorff, 2011, p. 59) through the work made for the subterranean exhibition Eyes Open (i): Drawing in the Dark (Robinson, 2014i), and for the duration of the exhibition while the work was installed underground. During the time spent in the cave, and in the time away from it, I habitually employed a reflective tool that I adapted from Fenton’s (2007) double-loop learning model (Figure: 5) as a method to momentarily stop practice and critically analyse the creative work.

![Figure 5: The adapted double-loop learning model for creative practice (Fenton, 2007, p. 37).](image)

Fenton (2007) identifies reflection “in and on action” (p. 38) as a mechanism to explore new choices in creativity through playful trial and error. I employed a method of reflectivity based on this model: replacing the terms ‘trial’ and ‘error’ with the words ‘edit’ and ‘refine’ (Figure: 6, p.43) to suit my creative process in both studio and field.
Figure 6: Robinson (2013), *Edit and Refine: Piercing the Research Surface* (Adapted from Fenton, 2007).
The terms ‘edit’ and ‘refine’ in Figure: 6 (p.43) are shown twice in red and blue text surrounding a node that sits underneath my research surface of traditional and digital printmaking. The node is aligned to the metaphor of the rhizome, which contains the potential for growth and is represented by a grey mesh-like net—a network of intertwined methods as a potential site for rupture.

The iterative cycle of editing and refining creates rupture points imbedded in the node—in and on action in my creative practice, wherever that may be. The edit-and-refine iterative cycle is undertaken as many times as required, in and through action, as action learning theorist Chris Argyris and learning theorist and philosopher Donald A. Schön (1974, as cited in Fenton, 2007) suggest. This process generates critical insights in practice by looping back on initial decision-making. The moment of reflection, walking away from a work to view progress from a distance, or to come in close and check a chemical relation in etching were important in allowing critical decisions to be made that defined the next step. For example, I was able to ask a number of questions by adopting Fenton’s (2007) double-loop learning model to monitor my critical thinking in the work *Real or Not Real* (Robinson, 2013i) (Figure: 7, p.45).
Figure 7: Robinson (2013i), *Real or Not Real, Xanthorrhoea preissii* resin, inkjet, graphite on draughtsman paper, 120 x 250 cm. Photographer: Sarah Robinson.
Was I caught up in repetition or tracing in the most literal sense? Through the studio process, the methodological reflective loop process began:

**Edit:** How am I going make this work?

**Refine:** Move the overhead projector forward and back, to ascertain strongest composition to begin the process of tracing the mesh.

**Edit:** Consciously, at the same time using graphite to trace the image and leaving certain areas out.

**Refine:** By painting *Xanthorrhoea preissii* resin over these traced graphite lines, the lines took on their own appearance and at that precise moment, intuitively, these lines grew so that on closer inspection they did not have the pencil outline from the original tracing.

It became apparent that to employ the double-loop learning model as a method, to link practice and theory that reflects praxis⁢, was crucial in developing my creative practice. My creative practice in this case changed by adopting the edit-and-refine method, one of many iterative cycles that were significant for this research and led to the praxical adoption of the rhizome.

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3 Praxis is “a dialectical relationship between the two [practice and theory], in which theory can learn from practice as well as direct and inform it” (Turner, 2006).
A Rhizome has no beginning or end; it is always in the middle, between things, interbeing, *intermezzo*. The tree is filiation, but the rhizome is alliance, uniquely alliance. The tree imposes the verb “to be”, but the fabric of the rhizome is the conjunction, “and . . . and . . . and . . .” (Deleuze & Guattari, 1988, p. 26)

In the field of biology, a rhizome is an underground stem. This stem can have starchy swellings named ‘tubers’—a common example is the potato. The potato is the tuber, a storage organ full of starch, ready to drive growth. The tuber has the potential to send out roots or shoots in any direction. Adventurous roots grow in a random fashion: they grow along, upward, sideways and diagonally (metaphorically likened to computational x, y, z-axis directions), seemingly defying gravity, not unlike the Helictites growing off stalactites in Crystal Cave (WA). Helictites are found in limestone caves and are formed from depositional calcite. Perceptually, Helictites appear to grow horizontally away from vertical stalactites, out into *space* as they change from their vertical axis several times during growth. Like Helictites, the potato rhizome begins its growth underground, but the difference occurs between the two structures when a potato shoot pierces the earth’s surface. A new potato plant forms; a new underground tuber develops, while roots and shoots emerge ad infinitum while the Helictite does not pierce the ground surface.

I observed a Tuart tree taproot that descended from the roof of Crystal Cave. Before the cave pools dried up, the taproot would have grown into a root mat that floated in watery cave pools, which suggested to me an image of a mesh-like structure. In my mind, the abstract rhizomic structure had become conceptually chaotic like small furry roots crossing, intersecting and overlaying with larger roots to form a root mat or mesh. This created a comparison to the physical system in which the humble potato grows. For me, the notion of
root mats as mesh, and the ability of the Helictites to grow in any direction provided a means of conceptualising the complexity of the research process in terms of the rhizome.

A conceptual process is a rhizomic framework that carries on and on. A conceptual tuber becomes the site of potential playful error (Fenton, 2012), error that is crucial in expanding concepts through studio practice. Ideas may metaphorically grow a root or shoot at regular intervals, representing moments of realisation where paths followed may be a fruitful avenue for practice or fruitless dead ends. When viewed as playful errors, these dead ends inevitably lead to other movements where a forced backtracking opens a different path. Where these pathways of thought or lines cross (Figure: 8, p.49, signified by pink lines), they create nodes (Figure: 8, p.49, signified by small blue circles), which in my observations, I considered a point or intersection in thought that benefits the process and production of the research. Deleuze and Guattari (1988, p. 8) refer to these points as sites of potential rupture (Figure: 8, p.49).
Figure 8: Robinson (2015), *Rhizome: Creative Ruptures for Practice* (Adapted from Fenton, 2007).
Ruptures occurred in my studio practice when notions around the rhizome—both theoretically and conceptually—drove me to consider alternative approaches in the field, for example, during a process of drawing in the studio that employed tracing over a projected digital image of a plant root (Figure: 9). A digital photograph was taken of a substantial plant stem that grew horizontally from a root base situated on a stony Tamala limestone cliff edge at Point Peron (WA). I was not satisfied with the resulting work and returned to the research site to take a frottage of the original root to re-evaluated the studio process of tracing.

Figure 9: Robinson (2013), Projection studio set up for *Studio Process Rhizome Drawing* (Figure: 11, p. 52), graphite on tracing paper. Photographer: Sarah Robinson.
For Deleuze and Guattari (1988), *tracing* is an abstract concept that traces over what is already there. Tracing is a linear way of thought that my work *Entrenched Drawing* (2012) (Figure: 10) explored through a process of literally tracing over itself again and again. This process was habitual in my practice. A rift occurred in the studio when I became acutely aware of my entrenched ways of practice. Deleuze and Guattari (1988, p.12) discuss the gestural as “susceptible to constant modification” (among other semiotic systems) as a way of regaining the freedom away from the original tracing. Unlike the static repetition of a tracing, this freedom conceptually revolves around a map, which presents as a constantly evolving object. Drawing can be like a map: it moves, it changes with each gestural or precise mark, other things influence it, it rotates, and it is layered with changes. Tracing repeats itself. Drawing evolves, which suggested to me a haptic change in the way I implemented drawing as a strategy in the studio. These encouraged movements in conceptualisation that became detectable in practice and began to drive my research.

Figure 10: Robinson (2012), *Entrenched Drawing*, results of drawing from projected images. Approx. 200 x 40 cm. Photographer: Sarah Robinson.
For Deleuze and Guattari (1988) “What distinguishes the map from the tracing is that it is entirely oriented towards an experimentation in contact with the real” (p. 12). To examine my own rhizomic path of conceptualisation away from notions of tracing I continued drawing from the same projection studio set up (Figure: 9, p.50) derived from the real plant root in the creative work *Studio Process Rhizome Drawing* (Robinson, 2013l) (Figure: 11).

Figure 11: Robinson (2013l), *Studio Process Rhizome Drawing*, projection from digital acetate, graphite on tracing paper, masking tape, approx. 82 x 150 cm. Photographer: Sarah Robinson.
As the drawing extended from the action of adding new sheets of tracing paper, joined and folded over repeatedly, the work began to resonate for me, with the observed length of the original root on the cliff top. Changes in my habitual creative practice had originated from underground immersion in a cave studio. Theoretical and conceptual understanding interconnecting with studio practice had caused a rupture in thought.

Rupture propels a line of flight according to Deleuze and Guattari (1988). The concept of a line of flight has significance for this research because it has a departure point—the leap taken in thought that drives practice in new directions. As conceptualisation developed in my practice, my creative focus changed, and I began to question the way I perceive the world in relation to my dilemma of finding ways to work creatively beyond what Baudrillard (1994, p. 177) suggests is essentially a copy of copy. Baudrillard put forward this notion in 1994, yet the ability to copy and reproduce images has been greatly enhanced by the advancement of digital technologies. I explored ways to deal with this digital intrusion into my printmaking practice by exploiting digital and traditional printmaking methods in an attempt to create works that were opposed to viewing the world solely through pixels.

Although the image Studio Process Rhizome Drawing (Figure: 11, p.52) aligned with the image inside my head of a root-like mesh, it was undoubtedly a literal interpretation of a rhizome. Even as I began to fold the paper over and over to preserve the drawing, it was not until a break-up in repositioning caused a conceptual shift that it occurred to me to use the rhizome as a conceptual tool. As I recognised this shift, my practice moved forward as if freed from habitual ways of representing the world. The visual and literal representation of a root that I initially employed to theoretically underpin and explain my creative conceptualisation quickly changed through ongoing studio praxis.
As I traced my presence through and in the world I employed an abstract map influenced by digital and traditional printmaking methods—a cognitive map which according to Deleuze and Guattari “has multiple entryways” (1988, p. 12). Film and media scholar Felicity J. Coleman (2010) supports a cognitive map as being Deleuze and Guattari’s rhizome that “maps a process of networked, relational and transversal thought, and a way of being without ‘tracing’ the construction of that map as a fixed entity” (p. 233).

A flexible map for this research was drawn from multiple entryways into toxic, non-toxic and contemporary 3D printing. New relationships and possibilities drawn between these multiplicities were discovered at the point of intersection. It occurred to me through the studio process when working on Projection Rhizome Drawing (Robinson, 2013f) (Figure: 12, p.55) that I could extend the “relational and transversal thought” (Coleman, 2010, p. 233) in my work by projecting similar images in a cave in an attempt to link the immersive experiences from Yanchep Crystal Cave and Yonderup Cave (WA) and Wookey Hole Caves in Somerset (UK).
Figure 12: Robinson (2013f), *Projection Rhizome Drawing*, projection from acetate, graphite on tracing paper, masking tape, approx. 70 x 70 cm. Photographer: Sarah Robinson.
After all, I had been employing older lens-based technology by using an overhead projector for enlarging the image in the works (Figures: 9, 10, 11 & 12, pp.50-55) with a lens-focusing ring to project a transparency photocopied from digital photographs taken at Point Peron (WA). In this work, my vision was disrupted by projecting the digital image via a photocopy transparency to work through my thoughts on how technologies may alter our perceptions of the physical world’s *realities* through different technologies.

By using projection onto the cave wall, *Projecting a Telltale* (Robinson, 2015x) (Figure: 13, p.57) attempts to interact and intersect my way of thinking. The digital image taken from a Geotech *telltale* (a device to monitor movements in cracks) installed across a crack in limestone rock found in Crystal Cave (WA) was transferred through projecting the same telltale image onto a similar position over the wall of Wookey Hole Caves—the image of the telltale had transcended continents. What did this act mean? Subconsciously I was experimenting with the notion that in fact, these continents had physically separated from Gowanaland (the name given to an ancient supercontinent) a long time ago (in geological time). The Crystal Cave Crangonictoid was identified as a Gowanaland relic (Jasinska, 2000–2003) that had existed when the continents were joined. However, the playfulness of the projected digital image was an important device used to suggest visually the metaphorical crack I imagined between traditional and digital printmaking.
Figure 13: Robinson (2015x), *Projecting a Telltale*, image from Crystal Cave (WA) onto crack in the wall of Wookey Hole Caves (UK). Photographer: Sarah Robinson.
Summary

This chapter introduced the methodological approach employed for this research as I observed, recorded, and aligned visual data that I was creating in the field with my creative practice. Practice-led research was identified as the overarching methodology used to encourage cyclical moments of insightful decision-making and critical reflection, which are the primary methods I used for discovery. I also engaged a multidisciplinary approach that included collaborative practice across disciplines. The concepts of research *for* practice, research *into* practice and discovery *through* practice were employed as methods for research using archival, fieldwork, collaborative practice, and partnerships. These categories also defined the scope of the materials and printmaking processes implemented in this research.

The following chapter employs Rembrandt’s (1650, b, d, e) *The Shell* as a pivotal case study to trace the historical relevance of printmaking from traditional toxic etching techniques to contemporary digital printmaking. The in-depth study of *The Shell* States I, II & III provides a continuum from the original print to freely available online digital copies. A *Conus marmoreus* shell from the same species represented in Rembrandt’s etchings informs the dialogue of the journey from the original object (the shell) to the copy (3D print of a shell). This case study allows the examination of visual differences between toxic and non-toxic etching, original and copy, digital and simulacra. Investigations reveal the mathematical concept of ‘squaring the circle’ as a metaphor for viewing a world that has changed from a traditional circular lens to the contemporary 2D and 3D, square or digital lens.
Chapter Two
Observing and Recording
Very Small Things
Chapter Two: Observing and Recording Very Small Things

Prelude

Embedded in the digital image is the notion of *pixelation*, which occurs when a digital image is enlarged, revealing the individual pixel at a point where no further detail can be resolved at a given dots-per-inch (DPI) measurement in the image. I refer to the pixelation of images throughout this exegesis as a reference to the pixel, which is a geometric 2D square. I attempt to construct a metaphor for the pixel or square, replacing the circular lens for viewing our world. The construction of this concept was used to further my understanding of how the digital lens and the digitisation of images impacts our visual cognition. To experience the possible digital impact I projected digital images of limestone geologies from Point Peron (WA) onto the stalagmite and flowstone formations in Crystal Cave (WA). This action revealed a significant visual contrast between ancient geologies and the contemporary digital image (Figure: 14, p.61). To understand how the digitisation of images affected traditional printmaking practice, I first worked in the field and subsequently conducted experimentation in the studio to compare and contrast traditional and digital printmaking processes.
Figure 14: Robinson (2014f), *Digital Projection over Flowstone*, PICO projector, Crystal Cave, Yanchep National Park (WA). Photographer: Sarah Robinson.
To investigate the impact of digital technologies on the reproducibility of images, I created the work *Rhizome: From the Studio to the Digital Cloud and Back* (Figures: 15 & 16, p.63). Through creative playfulness and using the various print technologies available to me, I investigated key understandings of the original object and its copy. Printing from a raised surface of a potato, a simple method of traditional printmaking provided a starting point that connected to traditions in print but also gave the ideal *original* from which to explore the digitalisation of images. The 3D printed *copy* of a traditional potato print matrix was positioned next to the *original*. By employing this simple juxtaposition, the original (now rotten) potato print matrix served as a reminder for the aesthetic value in observing the real. The process of making the 3D copy of the potato print began by physically cutting the word *rhizome* into the matrix before digitally scanning the carved potato. The resulting digital code was manipulated in 3D photogrammetry computer software programs before the digital code was sent to the 3D printer.

Figure 15: Robinson (2013e), *Original Potato Print Matrix* (now rotten), life size, created for the work: *Rhizome: From the Studio to the Digital Cloud and Back*. Photographer: Sarah Robinson.
Figure 16: Robinson (2013k), *Rhizome: From the Studio to the Digital Cloud and Back*, 3D print, 3.5 x 6 x 9 cm. Photographer: Ian Yendell.
Chapter Two: Observing and Recording Very Small Things

Introduction

Recognising the necessity to relate traditional etching methods to toxic nitric-acid etching, this chapter examines the rationale for selecting Rembrandt’s (1650b) traditional etching *The Shell*. As previously stated, this etching is used as a pivotal case study to provide a continuum for observing and beginning to record thoughts, which include the following practices:

i. tracing the history of printmaking from traditional toxic etching techniques to contemporary digital printmaking

ii. drawing connections between aesthetic and technical differences between toxic and non-toxic etchings

iii. providing a continuum from the original to the copy

First, *The Shell* (1650b) is employed as a historic image to investigate traditional and digital representations of the same object. I discuss the reasons for selecting Rembrandt’s *The Shell* etching, for a case study that revealed much in terms of observing the original print. Once the different states of Rembrandt’s print were examined either first hand or in the case of *The Shell* State III, online, I used them to interpret the continuum from the original print to the copy. Influenced by Baudrillard’s (1994) simulacra, the second part of this chapter continues the story of the shell’s transformation from its form in a traditional print to its form as a digital 3D print. The object—the *Conus marmoreus* shell that I bought from a market was manipulated through observational drawing and using 3D photogrammetry techniques in order to examine values in observing the original print, that drew connections between aesthetic and technical differences between toxic and non-toxic prints. The third part of the
chapter documents the 3D print process replicating the shell, which informed the dialogue of the journey from original object (shell) to the copy (3D print of the shell). Informed by contemporary artists that use 3D print (Marc Quinn, 2012, 2013, 2015, Flora Parrott, 2012, and Alessa Tinne, 2011) this process questioned concepts that position my work in the contemporary printmaking field. Unintentionally, this process unearthed a prominent continuum in the concept of squaring the circle that became a metaphor within my practice.

The analysis of the history of traditional toxic etching techniques drew connections between aesthetic and technical differences to non-toxic printmaking methods. This analysis was made clearer by examining the continuum from the original to the copy. Contemporary artist and academic Paul Coldwell (2016) whose research into digital technologies affect on printmaking states that printmakers “now have a huge range of possibilities at their disposal and while some are returning to earlier processes to comment on our contemporary condition, others are engaged with the possibilities offered through pure digital printing” (p. 1). Coldwell (2016) contends that the digital has invigorated traditional printmaking processes, but adds that “we should be wary that new technology doesn’t necessarily mean new ideas, in the same way as the use of tradition [sic] processes, doesn’t necessarily mean a retreat into tradition” (p. 2).
i. Tracing the History of Printmaking from Traditional Toxic Etching Techniques to Contemporary Digital Printmaking

To trace the historical relevance of printmaking from traditional toxic etching techniques to contemporary digital printmaking, I searched for a print that represented to me a superb example of a toxic processed etching. I identified Rembrandt’s *The Shell* print as an example of a toxic etching to position against the less favourable results I observed in practice from adopting non-toxic etching methods. With this purpose in mind, I undertook a detailed analysis of Rembrandt’s original etching *The Shell* at the British Museum in London (Figure: 17).

![Rembrandt's The Shell](image)

Figure 17: Rembrandt (1650b) State I: *The Shell (Conus marmoreus)*, etching, drypoint and burin, size 13.2 x 9.7cm. Courtesy of The British Museum, London.
Recognising the impact digital technologies was having on my printmaking practice, it became valuable to compare contemporary non-toxic etching processes to the traditional discipline of etching, which is over 400-years old (Lumsden, 1962). To explore notions of the aesthetic quality that the toxic etching line retains compared to the non-toxic saline-sulphate etching, my enquiry led me to investigate which mordent Rembrandt had used to etch *The Shell* (Figure: 17, p.66). Rembrandt most likely employed a form of dilute hydrochloric acid (Lumsden, 1962). It was illuminating to establish that Rembrandt worked on copper etching plates that were hammered flat by hand and not cold-pressed in manufacture, as are modern etching plates. Rembrandt scholar Erik Hinterding (1993–1994) wrote extensively about Rembrandt’s etching technique suggesting that using the copper plate was as expensive in Rembrandt’s day as for contemporary printmakers.

I began to investigate how Rembrandt may have observed the world within the confines of the technologies available in the seventeenth century. How did seventeenth-century artists observe the world? I drew on an unexpected area for examination revealed by art historian Svetlana Alpers’s reference to Rembrandt’s choice of a shell as a still-life subject. Alpers (1998) suggests that the shell was chosen because they “were thought to occupy a separate category on the borderline between art and nature” (p. 20). It appears to have been a common belief in the seventeenth century that collectors considered shells to be equivalent to nature itself, as if an artist had crafted them. Alpers (1998) argues that the value of the shell is different from the values of realism attributed to the usual still-life paintings in the seventeenth century, stating that shells are designed “to fool our eyes into thinking they are the real thing” (p. 19). Often such realistic works in the seventeenth century focused on using expensive materials to heighten the allure of realistic grandeur. With this notable difference in the convention between realism and materials, Alpers (1998) argues the difference
between Rembrandt’s interest in the materiality of the etching process as opposed to the idea of using the etching technique to produce a realistic picture of the shell as a mere “taste for representation” (p. 20). Alpers suggests that Rembrandt was pursuing the aesthetics of the etching technique in *The Shell* to draw out visual attention to the technique itself, rather than to draw attention to the object the etching represents. What is intriguing about Alpers’s (1998) argument is the idea of the power of an inanimate object (the shell) as a symbol for a juncture between art and nature—a symbol that has the potential to represent the juncture between traditional and digital printmaking for this research. The shell’s ability to demonstrate a difference from the norm intrigued me. What could my experiments in 3D printing produce to explore tensions between traditional and digital printmaking? This perspective had implications for my practice in relation to the notion of a *rupture* (Deleuze & Guattari, 1988, p. 8)—the point where a line of flight or lateral shoot breaks free from the rhizome. This notion of rupture introduced a new way of understanding Rembrandt’s (1650b) *The Shell* and therefore the conceptual thrust of my project. Where one impression or vision connects to or more importantly, suggests another in practice.

It is not surprising that due to the advances in technology in the seventeenth century, including developments in scientific circular lenses for telescopes and microscopes that could be used to scrutinise objects, Rembrandt focused attention on a specimen of a *Conus marmoreus* shell in 1650. Thought to be a toxic predatory sea snail shell of Indian–Pacific origin, this object represented a departure from the norm, in that the shell was an unusual specimen not commonly available in the seventeenth century. For Rembrandt, the *Conus marmoreus* shell would have been a symbol of the strangeness of the new world, pitched against the conventions of representation in the seventeenth century. Finding the online representation of Rembrandt’s *The Shell* print precipitated a change in my thoughts long before any reflective analysis of *The Shell* began. For me, this moment functioned as a
powerful rupture and one that expanded my creative practice in unexpected ways. My initial online digital viewing of Rembrandt’s (1650) *The Shell* stimulated my imagination and provided a context in which to explore how new digital technologies could bring about an enhanced understanding of the world through the re-imaging of a shell.

ii. Drawing Connections: Aesthetic and Technical Differences between Toxic and Non-toxic Etchings

By using the case study of Rembrandt’s *The Shell* State I, was able to scrutinise differences in the qualities of traditional etching compared to contemporary methods of etching and toxic compared to non-toxic printing techniques in my own practice. These ideas suggested that after viewing the online version of *The Shell*, it would be valuable to scrutinise Rembrandt’s original print at the British Museum. Such an opportunity could open up new conceptual pathways through direct observation, as I asked myself what might the drawing process reveal of the differences between observing an original 3D shell (I had acquired a *Conus marmoreus* specimen) and a similar etched representation that I was able to analyse first hand at the British Museum. How would the process of drawing from the original print compare to a hand-drawn representation from observation of a similar shell? In my attempt to explore the continuum between the *model* (the actual shell), and the *copy* (the hand drawing of the shell), I developed prints that went through many traditional and digital transformations. The interpretation from the original print to a myriad of digital copies began with Rembrandt’s (1650b) *The Shell* print. The shell was used to inform a dialogue of the journey from the original object to a digital representation or copy. The original Rembrandt (1650b) etching of *The Shell* State I (Figure: 17, p.66) provided a strong framework to explore connections or disparities between physical objects, and the digital or original representations of them.
Figure 18: Rembrandt (1650d), State II: *The Shell (Conus marmoreus)*, etching, drypoint and burin, size 13.2 x 9.7cm. Courtesy of The British Museum, London.
Figure 19: Rembrandt (1650e), State III: *The Shell (Conus marmoreus)*, etching, drypoint and burin size 13.2 x 9.7cm. Courtesy of Rijksmuseum, Amsterdam.
I began by reproducing multiple copies from the same etching plate drawn from observation of my shell specimen. The literal interpretation of multiplicity was seen in my practice, by printing my own edition of shell prints. However Deleuze and Guattari (1998, p. 7) use the notion of multiplicity as a concept within the rhizome. Deleuze and author Claire Parnet (1987, pp. vii-vii) explain the notion of any situation as being a combination of multiple things that come together without ever becoming a whole because multiple things are affected by other multiplicities.

For this research, paying attention to the moment became a process that recognised the multiplicity (Deleuze and Guattari, 1998) of traditional and digital printmaking—that formed within the scope of this research—before scrutinising and analysing small things so that I could extract concepts for my creative practice from them.

Now influenced by Deleuze’s (1991) empiricism, I drew on the space between a set of multiple relationships, not the terms of the elements themselves but the mesh-like relationships between non-toxic and toxic etchings, digital technologies, my lifeworld, geologies, the theorists Baudrillard (1994), Deleuze and Guattari (1998) and Masuarri (1997), and contemporary artists such as Polke (2014), Quinn (2012, 2013, 2015), and Parrott (2012)—a complex network of relations between different disciplines, that had no preceding unity in constructing a new multiplicity for this research. This multiplicity established a process of close scrutiny between abstract spaces—it enabled Rembrandt’s shell etching to be used as a “multiplicity [that] has neither subject nor object, only determinations, magnitudes and dimensions that cannot increase in number without the multiplicity changing in nature” (Deleuze & Guattari, 1988, p. 7).
A Multiplicity: The Shell

Positioning Rembrandt’s *The Shell* as a case study to determine aesthetic differences between toxic and non-toxic etching created a working space that possessed conceptual value in examining changes in vision and knowing in relation to the digital aesthetic. I liken analysing the different states of *The Shell* to the development of conceptual and theoretical process through my creative practice. *The Shell* etching referenced the different layers in the physical process that were comparable to working through notions of the original and copy in sight of the 3D print process I was exploring through my practice. I watched hydrochloric bubbles rising from a nitric acid etching, chemically eating into steel plates, and I used ferric chloride to etch copper plates deeply with incised marks that would translate into black velvety lines when printed. I was using traditional hard grounds: rich in tan colour and blackened by smoking the plates that created purposeful marks and accidental scratches throughout the process. Through observational drawing, I was physically watching the shell, and visually devouring its structure through the etching process. At the British Museum, I was watching the shell under a different set of circumstances, not touching—just observing—but the original drawn print and materiality of the etching was very real.

Watching: The Shell

A deep black scratch is printed into the left side of the print *The Shell* State I (Rembrandt, 1650b) (Figure: 17, p.66), which does not touch any part of the shell or the background shading. Similar scratches and fine lines were observed on the front of the etching to the left-hand left side of the image, suggesting accidental marks that revealed the trace of the plates physical history.
The etching technique used to create *The Shell* is delicate; horizontal lines are visible to the naked eye in the greyish paper, with a tinge of red, as etched lines follow precisely the contours of the shell form. A whiter rectangular background appears around the shell—this whiter frame may or may not have been intentional; it could have resulted from the packing used as the plate was run through the etching press. The lighter tone of the background adds tonal values in a distinct black edge on the drawing outlining the top edge of the shell.

The white background in *The Shell* State I (Rembrandt, 1650b) (Figure: 17, p.66) appears superior to the image making in *The Shell* State II (Rembrandt, 1650d) (Figure: 18, p.70) because the angle of the shadow is a great deal more notable on the lip and aperture of the shell in *The Shell* State I. The siphonal notch in the posterior shell aperture in State II is notably stouter in form. This stoutness is not as alluring or reminiscent of the shells beauty as is the rendering of the same siphonal notch in State I. The print is signed in the correct manner, adhering to the printmaking aesthetic, which indicates that Rembrandt incised his name in reverse in recognition of the prints mirroring.

Did Rembrandt take the chiral into consideration? Chirality is a property of asymmetry found in biology; shells represent the concept of chirality because a shell’s structure and its mirror image are not superimposable. According to Hinterding, Luijten and Royalton-Kisch, (2000), “Rembrandt overlooked [the fact] that asymmetrical snail shells of this kind, seen from below, always coil in a clockwise direction” (para. 2). The shell in the print displays an anticlockwise coil, even though it is documented by marine biologist Helen Scales (2015, p. 64) that most shells are naturally right-handed coilers. Rembrandt may well have owned a rare left-handed coiled specimen, which presents in his print as a right-handed coiler.
because of the mirror image. The concept of the coil reversal through print challenged my comprehension. While holding my own Conus marmoreus shell specimen in one hand, and drawing its coil with the other, I attempted to imagine through this drawing process why Rembrandt reversed the shell, and as suggested by Scales (2015, p. 64) I wondered whether this was for aesthetic reasons.

I was conscious of the shell form being described by light; its lustre is greater in State I than in State II (Figure: 18, p.70). I purposefully viewed The Shell State I (Figure: 17, p.66) from a distance at which the linear marks became lost, replaced by beautiful tones, making the work appear more realistic without the shading that is seen in State II (Figure: 18, p.70). In my sketchbook, I analysed the prints through drawing. I was able to discern the differences in cross-hatching between the two states. Aesthetically, State II seemed unconcerned with the patina and heightened realism achieved by the technique in Rembrandt’s drawing in State I. The subtle edge of the concave curled lip of the shell that appears in State I was lost to the background shading. The appearance of the shell form had been subtly changed through the reworking of the plate between State I and State II. I also observed a clear shortening of the shell at its anterior end, which creates a blunted appearance in State II. The shell lip is no longer convincing and extra lines have been thickened in a considered attempt to become more formal.

The shells patterned surface that is observed in State II does not seem to match the same pattern in State I because the shadows in-between the white patterns have been extended and flattened. It is as if the shaded marks clearly resemble someone tracing over the original intentions of the artist, suggesting that Rembrandt (or possibly an unknown other) became engaged in an absorbing process of tracing over the original lines. The traced drawing incised over the shell pattern in State II appears stylised, the pattern of the shell formed by tracing
with a etching needle created elliptical, lighter *teardrop* like shapes for each lighter section in the overall mesh pattern. Teardrop shapes that are misshapen when compared to each counterpart seen in State I; this enhances the mechanical look in the quality of line observed in State II.

At this point in the case study, I became suspicious when drawing *The Shell* State II into my sketchbook. I felt that it was likely that a hand other than Rembrandt’s was responsible for emphasising the mesh pattern over State I. The act of drawing requires intense scrutiny. After examining *The Shell* prints States I & II, I could see a difference in the marks made. My archival research later revealed that this was very likely the case, first suspected by art historian Arthur Hind (1923). Here I attempt to establish—although a subjective method of observation is used—the value of perceiving the original. I could see the essence of another hand in the original Rembrandt shell etching by scrutinising very small things even before I confirmed the suspicion was true.

To comprehend Hind’s (1923) suspicion that one hand had traced and edited over the other in greater depth, the work *Drawn by An-other (i)* (Robinson 2015m) (Figure: 20, p.77) and *Drawn by An-other (ii)* (Robinson 2015n), (Figure: 21, p.77), examined the act of another artist, Annette Nykiel, drawing over my first state print to determine whether it is possible to perceive a difference in the two hands.
Figure 20: Robinson (2015m), *Drawn by An-other (i)*, etching on copper, drypoint, plate size 13.2 x 9.7 cm, Hahnemühle paper 78 x 122 cm. Photographer: Ian Yendell.

Figure 21: Robinson (2015n), *Drawn by An-other (ii)*, etching on copper, drypoint, plate size 13.2 x 9.7 cm, Hahnemühle paper 78 x 122 cm, An-other: Annette Nykiel. Photographer: Ian Yendell.
I speculated in Rembrandt’s case that this *tracing* might have been an involuntary process because the appearance of the newer lines in *The Shell*, State II is not accurate compared to those in *The Shell*, State I. The newer lines hold the appearance of being traced over and over again. It is almost as if the artist became subconsciously lost in a mesmeric process. I also considered the possibility that Rembrandt’s focus was on the etching process alone, as the object became subservient to the etching—a process that no longer involved observing the shell, but habitually tracing over the already laid grid of the shell pattern as the materiality of the drypoint process took over. If this tracing were drawn onto an overlaying transparent sheet and viewed separately from the traced shell pattern, it would appear grid-like or mesh-like. State II sees this grid-like pattern flattened by a process of redrawing and tracing over the top. This conjecture is supported by Hind’s (1923) suggestion that it “is only in the extremely rare first state that the print can be fairly judged” (p. 105). Indeed, *The Shell* State II (Figure: 18, p.70) also displays the structure of a background as if it has been added—perhaps to suggest the shell rests on a table—either by Rembrandt or by another hand.

It was only through viewing these differences firsthand that this visual change was brought to my attention. The process of careful drawing from observation highlighted the differences in Rembrandt’s *The Shell* State I and II (Figures 22 & 23, p.79). Through such observation, the mesh-like quality of the tracing as it ran over the pattern of the shell in State II (Figure 18, p.70) appeared.
Comprehension of this subtle difference would not have occurred if I had relied on the observation of the digital reproduction. Drawing takes time and energy, a process of back and forth rhetoric in which the advantage is engaging with thinking through drawing. The actual size of Rembrandt’s original shell print and the visible qualities of the paper on which the etching was printed contributed to me gaining a material understanding that was absent when the same shell prints State I and II were viewed online. The visual transformation away from Rembrandt’s original etching continued: I drew from my own Conus marmoreus shell (as a method to explore the benefits of using my innate visual perception) on the same size plates as those used by Rembrandt.
A particular observation lay in sketching (Figure: 23, p.79) the redrawing of the shell siphonal notch, when it became apparent that in the original print *The Shell* State II the notch had became much more sharply indented, diminishing the curvature of the notch as observed in *The Shell* State I. This redrawing between the two States of *The Shell* print suggested a shift away from realism and the notion of creating beautiful work, as if nature sculpted beautiful shells in the same manner as an artist would, as noted by Alpers (1998, p. 20). Alpers studied the context of Rembrandt’s choice to represent this shell—a still-life motif defined by Alpers (1998) as being an image without the presence of, in Rembrandt’s case, his usual human figures—“[u]nique in his print oeuvre” (Hinterding et al., 2000, para. 1).

An answer to the reason Rembrandt chose this shell as inspiration can be found in the context of the seventeenth-century world in which Rembrandt worked. The seventeenth-century world was opening up culturally and scientifically through increased trade due to improved sea navigation. Such navigation allowed specimens such as shells to fall into the hands of collectors and the rich elite. This new access to previously unseen specimens developed artists’ practice into “virtually scientific modes of describing inanimate objects” (Grootenboer, 2006, p. 5) and led artists to be obsessed with “observing and recording reality” (Grootenboer, 2006, p. 5). Alpers (1998) notes that the “shell was an example of natural artifice, of Nature acting like an artist” (p. 20); this idea resonates with contemporary artist Quinn’s (2015b) reflection on the beauty of nature as “the creation of pure beauty without conscious thought” (p. 15), which was developed in Quinn’s work *The Supra Littoral Zone* (Quinn, 2012) (Figure: 24, p.81).
It is uncanny for my own creative practice in the similarity of questioning concepts of re-imaging the real to how Quinn (2013, 2015b, 2015c) investigates shells as “an exploration of our relationships to our bodies and to the physical and cultural world around us. What it means to live in a world that is both real and virtual” (Quinn, 2013, para. 4). Quinn used 3D print technologies that produced giant shells “so effectively [that] what happens is that the form of the shell becomes a binary code, like DNA [deoxyribonucleic acid]. It becomes an image in the computer . . . the computer tells this 3D printer . . . it takes a very long time . . . so then the object comes out” (Quinn, as cited in Celant, 2013, p. 32). I asked how 3D print could be implemented to explore my own relationship to the original from examining objects in the physical world. Online contemporary art reviewer Ingrid Melano (2013) aptly refers to Quinn’s shells as “created by a computer’s digital code which reflects the biological code of DNA which created the originals” (para. 2). I employed a digital code not only to translate the biological codes of objects (potato and a reconstruction of the crangonyctoid) but also to transform a geological specimen (a carboniferous rock)—the physicality of the real into the digital realm.
In a similar way—to my use of translating natural codes from physical objects into the digital—Quinn uses 3D print technology to highlight differences between the real shells found on the beach and a 3D print that breaks down barriers of the real in a digitalised virtual world. A notion comparable to Alpers’s (1998) argument that Rembrandt was intentionally creating a difference between what the shell is made from and a picture (representation) of it through the way the shell is drawn. Both artists, Rembrandt and Quinn, working centuries apart, are experimenting with interpretations of the real. Rembrandt (1650b) was exploring the real through the hyperrealism in drawing the patina of *The Shell* State I, and Quinn by upsizing the shell fragment but retaining the essence of the real shell fragment through form, texture and patina in the work *Frozen Wave (Conservation of Mass)* (Quinn, 2015a) (Figure: 25).

The work of Quinn could easily be contextualised to inform a dialogue of the process of copying the original shell fragment to procuring a large-scale 3D printed copy. The influence of the digital aesthetic is intriguing in Quinn’s work—I see parallels in practice with my argument of finding value in copying and changing size of objects via 3D print technologies to referencing the real object in testing its boundaries.
iii. Continuum from the Original to the Copy

A valuable work for investigating the concept of an original print, and how a reproduction of it may devalue the original, is a reproduction of Rembrandt’s (1650d) *The Shell* (Rembrandt House Museum, 2015f), (Figure: 26) ordered online from GeoTypico (2015). This reproduction was digitally extracted from the original Rembrandt etching, which provides insight into the vertiginous heights we have reached in digitally copying things in our world. I could have “A Rembrandt On Your Wall...” and “The final result comes very close to Rembrandt’s original” according to the accompanying literature supplied with the reproduction print received via GeoTypico (2015) from The Rembrandt House Museum (2015f). How had the fact that this copy was freely available to order online affected its relationship with the original? The integrity of this reproduction print is questionable, as is its contextualisation in the field of contemporary printmaking.

Figure 26: Reproduction of *The Shell* (*Conus marmoreus*) (1650f) from Rembrandt House Museum (2015f) distributed by GeoTypico (2015), photoetching and engraving, 24 x 32 cm. Photographer: Sarah Robinson.
Rembrandt: Etching the Digital Shell

This section discusses the process of digitally copying the original etching of a shell (print), to reproduce it so that it can be converted back into an etching to create an original print. Digitally photographing Rembrandt’s (1650c) original etching of *The Shell* was the first step in producing this reproduction (Figure 26, p. 83). The resulting digital image was transferred, using photosensitive film, onto a copper etching plate. This plate would have been exposed to ultraviolet light, which hardens the non-image areas so the black lines from the original print can be washed out from the unhardened film; thereby, exposing the metal plate below. Subsequently the plate would have been immersed in acid to make a light trace in the metal and then handed over to an engraver, who would have worked over the lightly etched lines into the metal plate, transforming the digital photographic process of copying from the original. The copy appears overly mechanical in appearance by the addition of the traced engraving. I contemplated if the engraving process undertaken by The Rembrandt House Museum, in reproducing Rembrandt’s shell print was intended to reinforce somehow, the work of the original artist, Rembrandt. It may well have been a technical decision to perhaps make the etched lines clearer in the reproduction.

The lines on the reproduction-etched copy are uniform; they have a *monotony* of visual quality that is not displayed in the original. The explanatory text accompanying the print states that the “final result comes very close to Rembrandt’s original” (Rembrandt, 1650b). To my traditionally trained eye, the reproduction exhibits little traditional etching aesthetic. My dislike of its digital–mechanical appearance was exaggerated by the engraving over the photoetched plate. Each line is mechanically uniform in tone and lacks drypoints traditional burr or beauty—the pleasing aesthetic found in the irregular. My examination of Rembrandt’s original prints *The Shell* States I & II (1650 b,d), at the British Museum and the digital photoetching process that has led to the shell prints reproduction (Rembrandt House
Museum, 2015) leads to question whether these prints provide weight to my argument that the digital has had a profound effect on notions of the original. There are several possibilities for how the contemporary reproduction/digital copy affects the status of Rembrandt’s original print of *The Shell*, of which different states and editions are held in the British Museum, the New South Wales Gallery and the Rijksmuseum.

The experience and aesthetic value gained from viewing the original at the British Museum articulated a great deal more than the copy I obtained from The Rembrandt House Museum. In the British Museum, I could see scale, size, and detail of scratches, velvet lines, and the aura of the print’s history, a print that has survived in pristine condition since 1650. The *real* print, its physicality, meant everything to me because it provided a benchmark for this research through providing a working understanding of difference.

My search for copies of *The Shell* continued as part of my endeavour to apprehend concepts of the model–copy, copy–representation. I downloaded a high-resolution image of *The Shell* from the Rijksstudio (2012) to manipulate in any way I deemed fit. Rijksstudio (2012) is an online digital studio from which anyone can access and download images from the collection free of cost. Members of the Digital Innovation Think Tank (Rijksmuseum, 2012) criticise the possible effect of digitalising entire museum collections in relation to how such digital availability of artworks might affect the original held by the museum. Tony Chambers, the editor-in-chief of Wallpaper Magazine (as cited in Rijksmuseum, 2012) asks the following question: “Do we feel there will be a point where we get a reproduction that is so true, that is so real almost, that it negates the need to visit an original, because what value does the original have?” This is not an old argument if we reference Baudrillard (1994) and his notion of “a copy of a copy”, which renders the original defunct in that the “duplication suffices to render both [the original and the copy] artificial” (Rijksmuseum, 2012). Taco Dibbits (Director of Collections, Rijksmuseum), undermines Chambers’ suggestion that the original is redundant by stating that “to say that it [the digital online copy] will go above the
Philosopher and cultural critic Walter Benjamin (1935) discussed shifts in perceptions due to the influence of mechanical reproduction in 1935. The concept of aura is removed from an object, the original, through the ability of technology to reproduce the object many times. Aura is lost as the image loses traces of its physical history through digital reproductions. The marks of the object’s history vanish. The traces of materiality held in the original object became intriguing to me, as they were manifesting through developments in my studio practice. In the studio, I prepared *Xanthorrhoea preissii* resin for the work *Real or Not Real* (Robinson, 2013) (Figure: 7, p.45) by dissolving *Xanthorrhoea preissii* resin in methylated spirits. However, it did not take long to question the toxicity of *Xanthorrhoea preissii* resin. The combination of the resin and methylated spirits reeked of toxicity.

Benjamin (1935) states that “[t]echnical [or digital] reproduction can put the copy of the original into situations which would be out of reach for the original itself” (p. 3). With this in mind, I continued my investigations into the enabling process of 3D technology, which removed the reproduction of the *Conus marmoreus Shell* (Robinson, 2015) into situations that “may not touch the actual work of art” (Benjamin, 1935, p. 3). Benjamin (1935), like Baudrillard (1994), implies that the presence of the copy depreciates the value of the original. Copies of my *Conus marmoreus* specimen were developed through etching and 3D print, inspired by Rembrandt’s original shell print.

I placed etched, digital and 3D printed copies of my *Conus marmoreus* specimen in
different situations. They were displayed on the high-resolution digital wall in Spectrum Project Space, and as small coloured 3D prints placed on a steel box or suspended in a glass nitric-acid jar in the work *The Digital Imposter (Also Known as Toxic Substitute)* (Robinson, 2015i). I was exploring the concept of the removal of the copy away from the original in the sense that the reproductions became far removed physically and conceptually from the original Rembrandt etching. This could also mean (in the context of the copy no longer attaining Benjamin’s (1935) notion of the lost aura of the original) some kind of conceptual connection to the process of digitally scanning my original potato print that was employed to capture the data required for 3D print in the technical process of *Re-transitioning Into Three Dimensions* (Robinson, 2013g) (Figure: 47, p.133). Seemingly this scanning process replaced the physical potato with the digital—without physically or metaphorically touching the original.

For Benjamin (1935), the “authenticity of a thing is the essence of all that is transmissible from its beginning, ranging from its substantive duration to its testimony to the history which it has experienced” (p. 3). Will contemporary 3D prints be viewed in this way? It appears that the 3D print *Conus marmoreus Shell* (Robinson, 2015i) does not hold the sense of aura in the same way as the original specimen—it is very *plastic*—suggesting that the 3D print would not be viewed in relation to the physical history it experienced.

For Benjamin (1935), aura lies in the concept of authenticity, which is never questionable; he states “no natural object is vulnerable on that score” (p. 3). The significance here is that an object’s authenticity lies in whether it is a *real* object. Any attributes revealing historical traces attached to 3D prints may reside in the comments of the curator and spectator alone. Contemporary 3D prints are unlikely to reveal the visible nuances of their physical history; especially in drawing comparative evidence of such physical clues revealed in the scratches and marks observed in Rembrandt’s original copper etching plate and print of *The Shell*. The
evidence of a 3D prints history will very likely depend on the materiality of the 3D print, that is, whether it is printed with durable acrylonitrile butadiene styrene (ABS) plastic, which is almost indestructible. The object may not be inscribed with physical marks of its own history, it may only reveal the historical process of its making. However, if the 3D print is produced with natural material (e.g., clay or another biological material), it may reveal physical aspects of its history. Any inscribed marks; cracks or chips occurring in the natural material 3D print would oppose an attack on the object’s authenticity.

Although Benjamin (1935) was referring to photographic reproductions of artworks, the contemporary process of 3D print imitation operates in a similar way because replication begins with a set of digital photographs taken from the object and inputted into photogrammetry software. The software mathematically aligns key reference points in the photographs identified by the program. Alternatively, 3D prints are constructed from a digital process, which begins by directly scanning from the original object to capture the data necessary for the 3D print. I scrutinised the space or ‘digital slippage’ between the uses of analogue and digital images within traditions of printmaking to determine how interpretations related to the original. Through positioning with the work of other artists whose work appeared to deal with digital slippage I attempted to structure the influence of contemporary attitudes towards digital aesthetics on observing reality.

The power to reproduce images through printmaking’s ongoing technological developments from traditional to digital process has continually updated notions of Benjamin’s (1935) mechanical reproduction. Polke (2014) references outmoded analogue technologies in printmaking using the half-tone dot in mechanical reproduction. Polke (1998) explored the idea of printing errors incorporated in newspaper media in his work *Salamander Stone* (1998) (Figure: 27, p.89).
In *Salamander Stone*, Polke (1998) is deciphering the relationship between the original image and random printed mistakes found throughout the print process. The work *Salamander Stone* (Polke, 1998) exudes a rich materially that encourages a play on perceptions. Many transparent layers of enamel evoke the ambiguities of perception. A highly magnified newspapers printed mistake—an abstraction of the mistake—is seen as a globule through many layers of enamel imbedded with gold mesh. Unstable perceptions are implied through the experience of observing the enamel applied over translucent polyester—the original meaning of the newspaper-image fragment is lost through abstraction. The digital reproduction is a mechanical reproduction, “a series of binary signals recorded by a machine and requiring a machine to render this unseen ‘code’ readable by humans” (Betancourt, 2006, p. 2). I adopted a strategy of looking for printed mistakes in contemporary 3D print that could be exploited in my creative practice in a similar way that Polke (1998) employed printing mistakes in his creative work. For example, blips of incorrect digital information covered the smaller scale translucent 3D print Crangonyctoid (Figure: 28, p.90) with fine digital hairs (Figure: 29, p.91) protruding in micro-like hairs built of small, clearly digital squares that irritate the hand with fine splinters.
Figure 28: Robinson (2015k), *Digital Hairs*, translucent 3D print Crangonyctoid with digital hairs, 10 x 1.5 x 7 cm. Photographer: Ian Yendell.
Contemporary artists Tracy Hill, Marilene Oliver, and Marc Quinn, continue to experiment with digital technologies that somehow scan or construct information derived from real objects. They may not be searching for the mistakes in the technologies but seeking copies of the original object to transform. Tracy Hill (2015) adopts commercial digital technologies to scan the landscape and combines the information she acquires from this with photoetching, printmaking and drawing processes in the studio. Parrott (2012) (Figure: 30, p.92) places
natures spiralled ram’s horn against its 3D print—scanned and mirror reversed. There would be diminutive content in the work if both 3D forms of the ram’s horn were positioned contactless side-by-side; for me, the contact line between the two ram’s horns is key to understanding the contrast between the original and copy. The perceptual slippage between the real ram’s horn and 3D printed plastic copy of the ram’s horn is highlighted by these two forms being secured together and mirroring each other—not dissimilar to the mirroring of the image in etching.

Figure 30: Parrott (2012), Loop and Return, ram’s horn, 3D print, plywood, life size. (Exception to copyright, Section: ss40, 103C. Exception: Research or study).

Parrott (as cited in Stockham, J. 2014) suggests that the process of scanning the original object provides a sense of “knowing . . . as though I had touched and drawn the object myself” (p. 22). Is the idea of knowing through technology convincing? What would such a reality mean? The significance that becomes clear here is the connection made between scanning as drawing. The significance of the connection between scanning and drawing lies in the way that the information is translated; the scanner records what technology sees, and is edited afterwards, while the artist thinks through drawing with options to edit and refines as they go. It is easy to comprehend how the digital-scanning process is like ocular scanning with the eye—scanning copies from real patterns; however, the importance of this process lies in what the artist accomplishes with this pattern. Painter and art theorist Wassily Kandinsky (1946) states the following in relation to a perfect drawing:
A perfect drawing is one where nothing can be changed without destroying the essential inner life, quite irrespective of whether this drawing contradicts our conception of anatomy, botany or other sciences. The question is not whether the coincidental outer form is violated but only if its quality depends on the artist’s need of certain forms irrespective of reality’s pattern. (p. 92)

For my creative practice, knowing was gained through technological processes in which I adopted scanning and photogrammetry techniques to collect digital data from the original, but in a different way from what is executed by observational drawing. I deliberated on what the differences between scanning and drawing might be while drawing from the original shell, print, and cave, through a process of immersion, which brought a cognitive difference in thinking through embodied experience. Kandinsky (1946) notes that the “imitation of nature is created by the hand of the artist processing a spiritual life of his own. It could never be a completely lifeless reproduction of life” (p. 92). Scanning and 3D print can be in danger of being lifeless reproductions. Although digital technologies are viewed as a mechanical process digital technologies have continued to change the physicality of the mechanical commercial printmaking process. My printmaking practice examines effects on image making that are brought about by digital technologies as 2D and 3D digital reproductions become simulacra.

I speculate that Rembrandt’s etching The Shell maintains an authenticity because it maintains a presence in time and space. Rembrandt’s The Shell prints authenticity is known because copies of Rembrandt’s The Shell print exist in the British Museum, Rijksmuseum and other institutions across the world. Objects such as Rembrandt’s prints of The Shell display the history to which it was subject through its existence maintains the concept of Benjamin’s (1935) aura.
The digital reproduction or copy is different from the original object in that it is easily transportable in time and space. A digital image of the shell’s markings sourced from a freely downloadable jpeg image Rembrandt (1650a)⁴ (Rijksmuseum, 2012) (Figure: 31) of Rembrandt’s *The Shell* was inkjet printed onto rice paper to playfully transport the repeated detail of *The Shell* pattern in time and space (Figure: 32, p.95). Rice paper was used because it is durable and can be successfully passed through a large-format inkjet printer.

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4 Their website states, “If you use our images for publication, then we request that you acknowledge the source (Rijksmuseum, Amsterdam). We would also like to receive a copy of the publication for our library” (Rijksmuseum, 2012).
In the work *Suspended Form: The Shell (Conus marmoreus)* (Robinson, 2015ag) (Figure: 33, p.96), the digital image (aided by the rice paper’s strength) was manipulated by being threaded with nylon and pulled into 3D forms suspended in the studio.
Figure 33: Robinson (2015ag), *Suspended Form: The Shell (Conus marmoreus)*, suspended digital inkjet print on rice paper. Photographer: Sarah Robinson.
A second experiment intended to transport the digital image that captured the toxic chemical reaction between a steel etching plate and nitric acid. This reaction produced toxic hydrochloric bubbles tracking along the drawn, mesh-like lines on the etching plate. Images of this chemical reaction were documented with an iPhone held above the etching bath (Figure: 34).

![Image of chemical reaction]

The serendipitous nature of the hydrochloric bubbles tracing the drawn lines on the etching plate reminded me of the fractal grid. Images of the mesh-like grid were edited in Adobe Photoshop and printed onto rice paper. Small Crangonyctoid transparent 3D prints were sewn onto the digital print on the crumpled rice paper and lit from underneath with light-emitting diode (LED) lights. The image of the chemical reaction defined by bubbles had been transported from the workshop and was relocated in the cave in the work *Nitric* (Robinson, 2014I) (Figure: 35, p.98). The installation of the work *Nitric* (Robinson, 2014I) was...
unsuccessful because it failed to develop strong conceptual connections between the visible Tuart tree’s root structures, which are positioned near the inflow site of a dried-up water source in Crystal Cave.

Figure 35: Robinson (2014l), *Nitric*, digital print on rice paper, size approx. 200 x 100 cm installed in Eyes Open (i): Drawing in the Dark, exhibition, Crystal Cave, Yanchep National Park (WA). Photographer: Ian Yendell.

I was expecting a transformational process through both image and location. I selected a minute detail of a chemical reaction printed onto rice paper where smaller sections from the original were digitally edited and repeated. Dibbits (Rijksmuseum, 2012) evaluates the possible effects of focusing on specific details of a digital image, which the Rijksstudio (2012) allows by providing freely downloadable images of objects in the museums collection.
Dibbits proposes that by selecting minute details from anything in the Rijksmuseum’s digital collection, the individual’s use of the digital information will suggest new ideas about the original work to the person who has downloaded them.

I wonder whether there exists a possibility that creating new artworks from the digital records of Rembrandt’s *The Shell* etching and the hydrochloric bubbles mesh image (Figures: 34 & 35, pp. 97-98) would contribute to the original print (object) being functionless. Media studies scholar Rex Butler (1999) states that signs—Ferdinand de Saussure’s (1972) mental concept of the signified and the material aspect of the signifier—“only refer to the real, we might say, through [sic] their difference from it” (p. 36). What of this difference, the notion of being identical and dissimilar at the same time? Butler (1996) argues, “The copy at the same time restates the original and usurps it, repeats it and takes its place” (p. 15). This is what my work is doing; it forms different representations of a potato, and shell, congruently identical, yet dissimilar and constantly exploring and...and...and... (Deleuze & Guattari, 1988). The strength here is a renewed desire to create objects (through the digital techno boom), which appropriate the essence of objects in some way.

Butler (1999) affirms there is a need to provide a use for something because it seems that “no object has any meaning in itself but only in its relationship to other objects” (p. 27). In essence, both Butler’s (1999) and Baudrillard’s (1994) simulacra see all objects as having “signifiers of usefulness” (Butler, 1999, p. 28). The notion of objects being functionless in relation to consumerism and production is explored by Butler (1999), who in drawing on Baudrillard (1968), argues that the purpose of objects operates “[w]ithin a system in which consumption and desire need to be produced . . . because objects themselves are no longer good for anything, no longer function as objects” (p. 28).
A different kind of functional movement from Butler’s functionless objects is experienced when viewing the science of photogrammetry techniques. I experienced excitement at being able to fly through the digitally created interior of the *Conus marmoreus* shell specimen (Video: 2, p.101). I experienced a powerful vision on screen, as my eyes remained almost static while staring at the movement into and out of the shell mesh; my nuisances of eye movement were imperceptible.

The animation *Exteroception (Re-representation of an Original Shell from Inside Out)* (Robinson, 2015p) conveyed a lineage of representations from Rembrandt’s original *The Shell* etching through increasing digitalised images of a similar shell specimen that are part of the photogrammetry process. The experience of watching the digital images derived from hand drawn or 3D printed copies from the original and images manipulated within the digital image alone, ends in a confused, disrupted image of the shell’s pattern. This confused shell pattern was returned to my computer screen from a portable network graphics (PNG) texture file uploaded for 3D printing at Shapeways. Photographs of a *Conus marmoreus* shell specimen had been aligned through a photogrammetry process that returned as an error in representation—the digital process had constructed a random pattern—which were appealing in creative practice, errors are not expected and hold a conceptual capacity to develop into stronger work.

My creative practice was also influenced by the concept of reactivating objects, a concept that lies in Butler’s (1996) notion surrounding appropriation. The creative work Imperceptible Realities (Robinson, 2015s) constructed relationships between objects. In constructing relationships between digital and traditional objects, Benjamin’s (1935) notion of reproducing something, that “[r]eactivates the object reproduced” (p. 3) was significant. The reactivation from the object reproduced occurred at several points during my Imperceptible
Realities exhibition. A significant reactivation of *The Shell* is seen in the work *Exteroception (Re-representation of an Original Shell from Inside Out)* (Robinson, 2015p) (Video: 2), which was displayed on a high-resolution digital wall (Figure: 36) through enhancing the ability to view aspects of the original object unseen by the human eye.

Chambers (Rijksmuseum, 2012) states that the “desire to experience the real thing [original artwork] can only be enhanced by the wider availably and reproduction of images”. I argue against Chambers’ opinion that the necessity to view the real thing, or as he implies the original, is enhanced because of the plethora of digital images available online. I realised that my desire to view firsthand the original etching of The Shell at the British Museum was driven by my awareness of the etching aesthetic, which is gained through a lifetime of printmaking practice. This assimilates Dibbits’s (Rijksmuseum, 2012) notion of the defining aura of a work, where he states “I think a lot of art is about emotion and there is something which is the aura of the original”. My desire to view this aura was the driving force behind my decision to view the original print.

I had experimented with 3D print to question the differences in representation of the real by encouraging the viewer to hold the work Conus marmoreus Shell (Robinson, 2015i) while viewing the work Exteroception (Re-representation of an Original Shell from Inside Out) (Robinson, 2015p) (Figure: 36, p.103) to experience in some way the digital influence in the capacity of tangible interaction with the world.
Figure 36: Robinson (2015p), *Exteroception (Re-representation of an Original Shell from Inside Out)*, 6 minute loop video, high-definition display wall, 100 x 80 x 250 cm. Film editor: Rakib Erick; Photographer: Ian Yendell.
Scoping: Circle Lens—Square Pixel

A coincidental moment that crucially affected my research, originated from viewing online a geometric engraving discovered by art historian and specialist on Rembrandt, André-Charles Coppier in 1916 (as cited in Boone, 1980, p. 25) (Figure: 37, p.105) on the reverse of Rembrandt’s (1636) etching plate for the print Return of the Prodigal Son. Pieter Rudolf Boone (1980) traced the origins of the geometrical engraving found on the back of Rembrandt’s etching plate, to a Spanish geometry book in which Ferdinand van Aertsz (a sixteenth century engraver and illustrator) illustrated a mathematical concept put forward by Juan Alfonso de Molina Cano (a sixteenth century mathematician and geometer). Boone found evidence for the original engraving having been reworked for different editions of the book. In one sense, this geometric trace was far more interesting to me than Rembrandt’s image on the reverse of the plate because I had never come across an image incised onto the back of a renowned etcher’s plate before. van Aertsz’s engraving referred to the mathematical concept of the squaring of the circle, a concept that emerged as a metaphor in my creative practice to relate to the manner in which the 2D flat pixel has replaced a circular lens through which to view the world. I consider this a conceptual device for exploring possible tensions between the circle and square or digital lens. I began to form a construct in my mind of how a circular lens, which was traditionally used to view the world until the advancement of technologies, had become reliant on the digital or metaphorical square lens. This following image intrigued me.
Figure 37: Ferdinand van Aertsz (1598), *The Squaring of the Circle*, reverse of Rembrandt’s etching plate *The Return of the Prodigal Son* (Rembrandt, 1636), 15.2 x 13.3 cm. Courtesy of the Rembrandt House Museum, Amsterdam, 2015.
The squaring of the circle references a concept that attempts to create a square in the same area as a circle, or equal in perimeter to the circumference of a given circle, through minimal mathematical steps. From a mathematical perspective, this problem remained unsolved for centuries using only a straightedge and arc-compass, can now be solved by employing contemporary technologies (Livermore, 2013).

van Aertsz’s (1598) engraved trace *The Squaring of the Circle* was eroded by Rembrandt’s recycling of the plate; the engraved trace became a palimpsest after the original image was cropped to suit Rembrandt’s design. For Boone (1980), there was sufficient evidence to demonstrate the origin of the engraved trace by using a process of reconstruction. The reconstructive process conducted by Boone (1980) was confined to the analogue film. Boone (1980) most probably placed a photograph taken from the original geometric design (van Aertsz, 1598) in the mathematical book alongside a photograph of the geometric engraving to create a photocomposition. This simple process revealed how cropping the plate had affected the geometric image, which provided evidence for its joining or to define what was missing, confirming the origin of the image. The transformation from a circle’s area and its perimeter properties into a square is a useful concept as an analogy for the way the world was traditionally viewed through a lens or circle, and is now most often viewed through the digital square lens. This provides a metaphorical overlapping of the circle into the square—or the *squircle*. The *squircle* is differentiated from the norm because the *squircle* is a metaphorical way of describing the merging of the traditional lens into a digital lens that has been exploited in hybridised prints.
Summary

This chapter has discussed three positions in which the historical relevance of traditional toxic etching techniques and contemporary digital printmaking was traced through the case study of Rembrandt’s The Shell (1650 b, c, d). The Shell provided a continuum for observing the original printed image and the digital copies of the etching that are freely available online. A dialogue of the journey taken from the original object (shell) to the copy (3D print of the shell) manifested in creative works. I constructed a viewpoint by comparing traditional values in observing the world with the naked eye against updated ways in which contemporary artists use digital 3D print technologies to observe the world. I found that such contemporary practices question the boundaries between the original and the copy. A coincidental punctum revealed the concept of squaring the circle, which created new thinking for my practice. Punctum, rupture, and line of flight affected my practice and led the research in new directions as I recognised conceptual shifts in practice and how to critically interpret these. Heightened by the infusion of 3D print, it appears that Benjamin’s (1935) notion of aura continues to be absent in the reproduction. In this chapter, I suggested that the concept of the squircle is a way of describing the merging of the traditional lens into the digital lens, which is a concept that has been exploited in hybridised prints. Digital technologies have seemingly superseded the values attributed to viewing the world with the naked eye. In the following chapter, I discuss how this realisation led me to examine further the position of my creative practice within contemporary visual culture, and how my practice was affected by the rapidly expanding digital technologies through which the world is seen.
Chapter Three

Positioning Creative Practice in Visual Culture
Chapter Three: Positioning Creative Practice in Visual Culture

Introduction

In the late 1990s, Woodcock (2013) and Mirzoeff (1998) predicted the effect of digital technology on images throughout visual culture. If we were to become conditioned to seeing the world through computer-generated digital technologies several possible changes might occur: one possible change might be the cognitive impact on our innate perceptions of the physical world. To explore the use of contemporary 3D printmaking as a material process, in this chapter, I consider notions of the original and copy through Baudrillard (1994), Deleuze (1983) and Massumi (1987) in relation to the concept of simulacra. The concept of non-toxic printmaking has filtered into the mainstream studio, alongside the dissolving parameters of traditional printmaking practice, which have been eroded by a digital aesthetic. References to non-toxic printmaking in this chapter change the emphasis from etching to 3D print technology to examine the effect that digital technologies have had on our perceptions of the real. I pondered if the original and copy could be defined in light of the digital by questioning what is real, virtual or simulacra.

This research positions my creative practice within a visual culture that derives images from a digitalised world. The influence of the expanding technology used in visual media (Mirzoeff, 1998) lays in the exponential increase in the way the world is influenced by and uses digital images as a construct of visual culture. Mirzoeff (1998) states that “[v]isual culture is a tactic for those who do not control such dominant means of visual production to negotiate the hypervisuality of everyday life in a digitalized global culture” (p. 4). Digitalisation of globalised culture has transgressed into areas of everyday life that specifically have a greater impact on individual ways of seeing. For example, virtual realities are developing
exciting dimensions in digital image making. Woodcock (2013) engages with digital technologies to create virtual reality, stating that the “question of reality (whether virtual or actual) can be addressed . . . by emphasising how the perceptual system encounters its worlds (reality), rather than by questioning whether or not these worlds or environments are real” (p. 173). Woodcock questions the role of perceptions within virtual reality; this question correlates with my research because my research deals with my perceptual encounter with reality. Woodcock distinguishes between our perceptions and how we observe the real world opposed to virtual encounters. Perhaps Woodcock gives credence to the benefits of actual perception as a way to posit a truth (whether real or virtual).

Simulacra

In *The precession of simulacra*, Baudrillard (1994) states that in the simplest form, a simulacrum is a copy of a copy for which there is no original. Continental philosopher 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” (p. 253). Roffe (2005) then extrapolates Plato’s concerns further by writing that “being a step removed from the model, the simulacrum is inaccurate and betrays the model” (p. 253). This hierarchal model suggests a suitable framework for gaining insight into 3D printing, which finds increasing momentum in the field of medicine, engineering and the creative industries. This technology was exemplified in the public domain by the ability to print a 3D gun from web-based blueprints in the comfort of one’s own home (Ball, 2013). In the context of contemporary international arts, Murray Moss (2011), curated *Industrial Revolution 2*—a 3D digital printing exhibition held in the Victoria and Albert Museum (UK) for which it acquired a copy of the 3D printed gun for display (Ball, 2013, BBC News, 2013). A global 3D printmaking rationale filtered into
the Australian context when Jenna Downing (2013) extrapolated the 3D printmaking options currently available for use both commercially and in the home. Downing (2013) examined the fused deposition modelling (FDM) process—a digital technology facilitated to print *Rhizome: From the Studio to the Cloud and Back* (Robinson, 2013k) (Figures: 15 & 16, pp. 62-63).

Deleuze and Guattari (1988) offer their notion of difference or *rupture* in the rhizomic concept as a theoretical reasoning that defines rhizomic thinking as a constantly changing system of thought. The point at which one impression or vision connects to, or more importantly *suggests*, another layer of thinking is developed in my practice to explore a continuum of networks in the context of the original and the copy. Metaphorically, the rhizome offered me an overarching visualisation of an abstract grid system based on vertical and horizontal planes—planes directly analogous to grids and structures—which developed into a fractal grid in my practice through adopting 3D print technologies.

![Figure 38: Khazar (2010), *Rhizome Intermezzo*, digital media, size unknown, (Exception to copyright, Section: ss40, 103c. Exception: Research or Study).](image-url)
It is not difficult to comprehend how the visual concept of a rhizome might pertain to the grid-like structure (Figure: 38, p.111) seen in contemporary artist James Khazar’s work *Rhizome Intermezzo* (2010) that signifies the random manner in which a rhizome works, with never-ending tendrils or potential lines of flight. However, this rhizome is confined in a square, perhaps signifying the *intermezzo* or break that occurs before the rhizome starts up again—a conceptual image, which immediately resembles the pixel, the building block for digital images. Squares (in multiples, with their edges aligned) can form a conceptual image of a grid. A digital computer 3D mesh is constructed by computer software with the fractal (Koh, 2002) as the underlying mathematical building block. The fractal’s digital structure in computer-generated 3D meshes can be construed as grid-like or plane-like. The virtual grid is often held in the cloud and created through mathematical points in photogrammetry computer software. This is what happened when I exploited the iPhone Autodesk 123D Catch software to create a model of the Crystal Cave Crangonyctoid; the cloud connected the digital to the real Crystal Cave Crangonyctoid.

**Digital Stratum**

Baudrillard’s (1994) notion of hyperrealism proposes that images are constructed in a way that detaches them from the real world, a world that no longer relies on the sign and signifier (Saussure, 1972). A classic example for Baudrillard was the full-scale model of the Lascaux cave in France (Conseil départemental de la Dordogne, 2014). Lascaux II—the copy—is positioned adjacent to the original Lascaux cave. It was important for conservators to build the replica to counteract somehow the feared decay and loss of the original. The physical replica is detached from the original in the world because the sign no longer relies on observing the original. The aspects of observing the real are removed. I imagine that the act
of accessing the real Lascaux cave by viewing its replica would be a strange experience. The copy cannot hope to convey an understanding of embodied experiences of the real, which convey the passage of time and the power of the paintings and engravings that are eons old. This change in perception is increased by the impact of digital technologies on creating replicas or copies.

An analogue photographic reproduction of The Hall of Bulls, (Ministry of Culture and Communication, 2016) painted on the Lascaux cave wall, hung on my childhood bedroom wall. I stared at this image of a cave painting at night—the image seeped into my consciousness. As a child, I did not understand the historical value attributed to this image or the cave paintings’ place in our history. The analogue photograph of The Hall of Bulls has been superseded by digital technologies that create new digital reproductions. For example, Lascaux III and IV (Conseil départemental de la Dordogne, 2014) are travelling exhibitions that use digital reproductions, virtual tours and 3D models of the original Lascaux cave.

Increasingly, the digital impinges on what it means to understand the world around us. Digital scanning, 3D digital photogrammetry techniques, and 3D print replace the stereophotogrammetry techniques and painstaking painted reconstruction of Lascaux II. There appears to be a contemporary necessity to preserve digitally aspects of the world that are disappearing before our eyes. Such aspects are digitally preserved for the same reason Lascaux II was created—to preserve the original. It is simply that the technology used has been updated. The irreconcilable fear of the Lascaux cave paintings and engravings being destroyed by fungus behind a closed and unimpressive door (Figure: 39, p.114) led me to create the work *Rhizome: From the Studio to the Digital Cloud and Back* (Robinson, 2013k) (Figures: 15 & 16, pp. 62–63). The preservation of the original potato did not occur except as documentation for this exegesis—after all, life decays, but the plastic replica, copy or simulacrum remains intact.
If the original, *the real*, had not left a trace and if the original no longer existed, there is a possibility that visual experiences gained from viewing the copy could be affected. A conundrum exists in visiting Lascaux II because the presence of the real Lascaux cave may play on your cognitive experience while viewing the copy. Subtleties in visual thinking—initiated from viewing such copies—might be gained or lost if in your subconscious, you knew that what you were looking at was a copy. Through my creative practice I started to ask what would happen if the real deteriorates to the point that it no longer exists (i.e., without trace), what effect would this have on the viewing the copy? There are several possibilities of how the copy would be viewed: one might be consumed by the loss of the original; one might be pleased that the copy survived; one might believe the copy was real.

Why is there a need to preserve the lost original by replication—the copy? Why this notion of creating a 2D or 3D reconstruction of things? Why is there a desire to replace the original, for example, the historical Roman arch lost in Palmyra, Syria, with a replica? The Institute for Digital Archaeology (2016) used photogrammetry 3D-construction techniques by collecting photographs of the Palmyra’s Temple of Bel Archway located in Syria, to drive computer-aided carving into marble to reconstruct a copy. A two-thirds scale of the Palmyra
Temple Bel Archway was placed in Trafalgar Square, London in April 2016, and will travel to Times Square, New York City and Dubai before being returned to the original site in Palmyra, where it is intended to serve as a historical reminder of the original and political statement against the original arch’s destruction by Islamic State. Member of the Council for British Research in the Levant, Professor Bill Finlayson, quoted by the British Broadcasting Corporation (BBC) news, questioned the rationale of the 3D Palmyra Temple Bel Archway reproduction stating, “The dangerous precedent suggests that if you destroy something, you can rebuild it and it has the same authenticity as the original” (as cited in Turner, 2016).

It seems that we have reached the point where creating digital archives of historical sites and artefacts is obligatory. The Factum Foundation (2013) and The Institute for Digital Archaeology (2016) aim to collect high-quality scans of threatened World Heritage Sites. Both companies are using digital approaches to copying historical artefacts and sites with non-contact scanning technologies. Lascaux II (Chris Leadbeater, 2015), III and IV (Conseil départemental de la Dordogne, 2014) serve as reminders that an original physical object can now be copied many times. Has the computer inverted the premise that “the eye perceives more swiftly than the hand can draw” (Benjamin, 1935, p. 2) sufficiently to warrant my fear that digital visions are becoming undisguisable from observations of the real? The process of digital scanning and printing constructs 3D models that challenge the eye and hand in their digital efficiency, while the traditional etching process encourages embodied thinking through drawing.

The advance of digital technologies has allowed the original to become transportable to, or contained on, screen (Figure: 40, p. 116). Although different states of the original print of Rembrandt’s *The Shell* (Rembrandt, 1650b) were probably intended for distribution in the seventeenth-century marketplace (Alpers, 1998), the idea of allowing the original to become
transportable to, or contained on screen alludes to a contemporary difference in notions of
distribution that the freely available online copies of Rembrandt’s print suggest. Notably, the
difference in distribution between viewing the original in situ as opposed to online is that
2D or 3D copies or replicas of artwork are now freely available to the viewer, in their own
home, meaning that the experience is devoid of an embodied engagement with the original
artwork. I tested this proposition by uploading digital images of *The Shell* to view on screen.

I ordered 3D prints from Shapeways of my shell specimen in lurid colours, and these were
sent to me in my own home. I considered the possibility of creating an online marketplace
for them through the Shapeways website while I was in the studio and temporarily placed
the 3D prints onto a steel box prepared with traditional etching ground in the work *Replica (i, ii, iii, iv)* (2015y) (Figure: 41, p. 117). The steel 3D printed shell attaches a material reference
to itself and the steel box on which it sits—pixels are barely visible on the steel 3D printed
surface (Figure: 42, p. 117).
These shells were printed with different materials; they were digitally replicated from the original in clear, white, and reminiscent of Yves Klein signature Blue (Klein, 1959), a vivid colour which for me was the most artificial looking print. This line of coloured shells represents a consumer’s ability to order colour and material preferences from the Shapeways (2015) 3D Printing Service and Marketplace. The notion of ‘print to order’ or to create your own online marketplace from which to sell copies and copies of copies of your 3D prints is revolutionising the mass-production of 3D print. These small 3D printed shells are replicated so many times that the shells stand in for themselves with no reference to the original shell—simulacra. Plato (trans. 1871), Baudrillard (1994), Deleuze (1983), and art critic Hal Foster (2001) question what is real and what constitutes a copy. If a copy is made, will this make the real or original redundant because the new copy now exists? According to Baudrillard (1994), simulacra or a simulation dislodges the differences between “true”, “false”, “real” and “imaginary” (p. 3). Baudrillard (1994) states that simulation is the “generation by models of a real without origin or reality: a hyperreal” (p. 1).
Simulacrum: Deleuze and Massumi

Massumi (1987) defines the simulacra as having the potential to be a “[r]esemblance of the simulacrum is [as] a means, not an end” (P. 91) extending the concept of simulacra far beyond Plato’s idea of a faithful reproduction, a copy of the original, or a purposefully distorted copy so that the copy can be viewed correctly. Massumi (1987) believes the concept of the simulacra has moved beyond Deleuze’s (1983) theoretical extension of Baudrillard’s simulacra as ‘simulation’ into a system in which it acts as a difference, that is, the “difference in nature between simulacrum and a copy, the aspect through which they form two halves of a division. The copy is an image endowed with resemblance, the simulacrum is an image without resemblance” (Deleuze, 1983, p. 48).

Foster (2001) argues that images are either attached to referents in the real world or are simply copies of pre-existing images (i.e. simulacra). Foster views this approach, as a reductive mechanism in relation to pop art’s photographic appropriation of consumerism, discovering that through image repetition, notions of the real comes through a punctum of trauma. Foster (2001) states, “[h]ere the return of the real converges with the return of the referential” (p. 168), which is arguably a significant position for us all in relation to how we negate the world. As noted by esteemed critic and writer Jeremy Gilbert-Rolfe (1999), a position that becomes increasingly important in contemporary culture is the pre-empted effect of the digital in a capitalist society. Gilbert-Rolfe (1999) warns that the computer could create “a world of technological production post-human in its obviation of the human” (p. 4). Donna Haraway (1991) also predicted the influence of technology on different ways of seeing the world, and warned of the dangers of us becoming cyborgs. Gilbert-Rolfe and Haraway both commented on the advancement of technology, which has now become an integral component of our contemporary world.
For media theorist Devin Sandoz (2003), indistinguishable visions between observing the real and the technological copy are updated in notions that offer a definition of simulacra that becomes an active representation in replacing Baudrillard’s (1994) simulacra’s inactive position. Sandoz (2003) retells the deceptive nature of a simulacrum as “it nevertheless deceives its viewer on the level of experience, a manipulation of our senses which transforms the unrealistic into the believable” (para. 4). Sandoz draws on art historian and academic Michael Camille’s (1996) notion that a simulacrum “calls into question the ability to distinguish what is real and what is represented” (p. 1).

In contemporary printmaking, the digital print utilises the technologies of computer programs as tools to manipulate an image on many levels. This might be to add, subtract or select layers with which to manipulate an image or parts of it before it is translated into a specific printmaking technique. This approach to preparing printmaking positives references historical printmaking processes but is multidisciplinary. The digital rationale prompts arts practitioners to question how to interpret a digital print. Frequently, confusion appears in the use of *digital* in printmaking terms, particularly in the contemporary art field. However, this discourse provides an opportunity for clarification within the lexicon of the digital aesthetic.

In my creative practice I “delve into the thickness of the world by perceptual experience” as posited by Merleau-Ponty (2002, p. 374). Deleuze (1983) sees connectivity through relationships in the world; it is by considering connectivity that Deleuze (1983) distinguishes between—as Baudrillard (1994) proposes—ideas of the dualistic original–copy and model–reproduction and suggests searching for new terms to define simulacra. Deleuze (1983) states “*Simulacra [sic]* are like false claimants, built on dissimilitude, implying a perversion, an essential turning away” (P. 47). They are referring to a turning away from the real, as simulacra rely on the resemblance of the copy to the copy. Deleuze (1983) stresses, “A copy
truly resembles something only to the extent that it resembles the Idea [sic] of the thing” (p. 48). Can digital 3D print recreate the idea of the thing, thus rendering a copy real?

For Deleuze (1983) and Massumi (1987), Baudrillard’s (1994) notion of original–copy and model–representation continually changes. Massumi (1987) believes that technology influences the many images dispersed throughout the world by creating images that are received through a digital code, leading to multiple images that “blur together in a pleasureless orgy of exchange and circulation” (p. 90). Deleuze (1983) and Massumi (1987) believe that Baudrillard’s (1994) dualisms of original–copy and model–reproduction represent a static position in relation to the simulacra. Deleuze (1983) posits a subversion of this static position, recognising the possibilities of a positive power held within simulacra proposed by conceptually aligning simulacra as “[b]oth original and copy, both model and reproduction” (p. 53). Massumi (1987) develops Deleuze’s notion of implementing “And . . . and . . . and . . .” (Deleuze & Guattari, 1988, p. 26) as a way to open up simulacra’s position and redefine simulacra’s conceptualisation in contemporary culture. Deleuze changed the conjunction ‘and’ by multiplying it. Massumi (1987) posits new potentials for the simulacra by using ‘and . . . and . . . and . . . ’ to transform the role of the simulacra.

Transformation of the simulacrum occurs through a reloading of terms interjected with ‘and’: original and copy, model and reproduction to open up a “glimmer of possibility” (Massumi, 1987, p. 97) for the simulacra. Within Massumi’s (1987) notion of an opportunity for the simulacrum, there appears to be a contemporary pursuit for digital-data visualisation that crosses many disciplines. This notion of asking ‘and . . . and . . . and . . . ’ is important to my practice of art because it appears that images blur with fearless taxonomy at the site of digital visualisation.
Summary

In relation to perceptual systems encountering the world in light of the digital aesthetic, I attempted to put forward a case for the indistinguishable relationship between original and copy, as boundaries were lost. This notion of the indistinguishable relationship was driven by research within innovative spaces in which digital visualisations were occurring, not only in my creative practice but also situated in contemporary culture driven by rapidly updating technologies. Digital and traditional representations were crossing over one another in my creative practice as 3D print was introduced as an analysable process through which to examine perceptual changes being made to a world inundated by copies. Deleuze (1983) and Massumi (1987) theoretically extended Baudrillard’s (1994) idea of simulacra and the notion of simulacra led me to examine contemporary copies of the Lascaux cave and the traces of the real that remain in the digital reproductions that serve as a historical preservation of the world. To examine the effect that digital technologies may have on our perceptions of the real, the research emphasis subtly gave way to the examination of contemporary 3D print technologies over traditional etching.

There is a capacity to create something new with contemporary methods of printmaking that leaves behind the out-dated hybridised print. The concept of the squaring of the circle was presented as a metaphor for examining differences between digital and traditional etching. This discussion was used as a strategy to lead to the following chapter, which examines how tools of science, specifically photogrammetry techniques, have led to the notion of the fractal as a rhizomic grid. The fractal provides alternative way to visualise physical objects and creates the possibility of avoiding seeing the physical world through pixels alone or by metaphorically drawing in the dark.
Chapter Four
Mediating the Physical World using Tools of Science
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Introduction

For this research I chose to mediate the physical world using tools of science—using digital 2D and 3D print technologies alongside traditional printmaking practices. My aspiration was to produce a body of contemporary artwork that could explore the possibilities that our innate human perceptions of the physical world are changing with the increasing use of and dependence on digital technologies. The position I take in this research recognises the benefits of digital technologies that enhance our relationship with the world, but also examines the hypothesis that over-reliance on a digital view of the world may be problematic. I am particularly intrigued by how technologies appropriated from science might be integrated into my creative practice. Mirzoeff (1998) recognises the necessity to continually reaffirm what the significance of the term ‘visual culture’ implies because of “the new urgency of the visual” (p. 6). Implying the urgency of the visual was created by the rapidly expanding digital technologies in creating images for contemporary visual culture. Underpinned by the notion of a world imbedded with digital images, this research draws on my sense of place as a way to examine the possible benefits of experiencing the original, as opposed to relying on digital renderings of the world. I left the Royal College of Art, London in 1987 at a point when the digital revolution in art and visual culture was about to explode. This point indicated the printmaking discipline was traversing a technical trajectory, which was historically linked to the attainment of highly technical skills in practice but was about to be infiltrated by digital technologies.
At this time, I experimented with the hybrid digital and non-toxic photopolymer ImagOn film. The work *Intervention* (Robinson, 2008) (Figure: 43) navigates the magic of direct contact of light onto film, digitally scanned from an analogue negative for a printmaking process that leads to different modes of representation, different forms, and different moments of an image. Using this hybrid technique, I scanned a family analogue negative and outputted the positive image in Adobe Photoshop before printing onto an acetate matrix with a large-format inkjet printer. I subsequently transferred this image onto an aluminium plate through the process of exposing the digital acetate onto an ImagOn photosensitive film. I was able to create a montage by adding the forceps at the stage of exposing the image to ultraviolet light. This was strange because I could have combined the two digital images using Adobe Photoshop creating layers option, before this stage. I judged this process of *physically* layering the two digital acetates as being quicker than digitally layering them in Adobe Photoshop, before combining the entire process using a non-toxic saline-sulphate bath.

Figure 43: Robinson (2008), *Intervention*, non-toxic photoetching (photopolymer) using digital positives, 58 x 59 cm. Photographer: Ian Yendell.
Similarly, *Space Syntax I* (Robinson, 2007) (Figure: 44) displays a photograph of a 3D model of my childhood home that was manipulated in Adobe Photoshop, while a separate Adobe Photoshop layer was drawn freehand with a graphics tablet. This work is an example of the first time that I integrated *digital* hand drawing with a digital photographic image. The conceptual framework for this series of work drew on space syntax theory (de Franca & de Holanda, 2003; Monteiro, 1997), which is theory used to describe different methods of spatial analysis. When creating this print, I used a syntax tree diagram to form the configuration that described the hierarchical spatial layout and domestic use of my childhood home.
In contemporary artworks (such as Marilene Oliver’s work (2010) *Fallen Dugra*) artists have continued experimentation with incorporating digital techniques into their practice by tracking developments in the field of rapidly expanding digital technologies. Such work has given rise to the term ‘digital aesthetic’, and has promoted academic debate for people who question the presence of a digital aesthetic (Meigh-Andrews, 2011). Some commentators might argue that for a long time, the digital aesthetic has been taking over the rendering of the visual images that infuse our contemporary world (Woodcock, 2013, Meigh-Andrews, 2011, Mirzoeff, 1998). However, the digital aesthetic has offered a new way of perceiving the world. For me, it has meant adopting new technologies by integrating the digital aesthetic into my creative practice in innovative ways.

How could our view of representing the world be changing? Drawing from the historical perspective of traditional etching techniques, for this research, I examined the effect of the digitalisation of images through practice. To support this decision to examine traditional and digital printmaking, my intention was to construct images that were derived from the original. To momentarily step away from the digital, I drew from an innate perception and critically engaged with my surroundings through drawing. I drew from direct observation from the experience of being in a cave studio, when I immersed myself in Crystal and Yonderup caves (WA) (Figure: 45), and Wookey Hole Caves (UK), using skills that had been refined through practice over many years.

![Figure 45: Robinson (2014g), Drawing in the Cave Studio, graphite in sketchbook, Yonderup, Cave Yanchep National Park (WA). Photographer: Sarah Robinson.](image)
In the cave studio, I drew on my innate ability to adjust my vision to perceive my surrounds in the dark when aided by artificial light. My drawing began from an embodied position and was integrated with familiar experiences and objects from my childhood such as limestone geologies, speleology and dental prosthetics. My drawing was also informed by Bolt’s (2010) notion of tacit knowledge production, which is the kind of knowing that acknowledges the uniqueness of the potential of any material to reveal explicit understandings of the world gained from “handling materials in practice” (p. 29). Bolt proposes that tacit knowledge creates a material cleverness synced to the ingenuity of the artist. I used these concepts as I continued searching for ways of experiencing the original to establish my sense of place.

Experiencing the Original: My Sense of Place

Both fieldwork limestone locations—in WA and in the UK—were selected for their limestone geologies, which embodied my lifeworld. Philosopher Edmund Husserl (1973, pp. 168–179), whose early impact on the field of phenomenology and the notion of the lifeworld, suggested that lifeworld is everyday knowledge—\textit{as lived} that is there, in a person’s life and references a person’s experiences of the past’s unknowingness of a world, that is created before reflective analysis is undertaken from it. Drawing on Husserl’s (1973) notion of lifeworld positions my creative practice alongside a specific awareness of my own histories that were established in, and encircled by, the limestone landscape. The familiarity of growing up surrounded by limestone geologies in the UK is important to my sense of place (Seddon, 1972). Engaging with the physicality of limestone geologies through caving and youthful experiences, my lifeworld preceded reflective action in creative practice, which has been influenced by such experiences. I cannot deny the inherent impact of the limestone landscape on my lifeworld because I subconsciously sought this familiarity after immigrating to Australia.
For Merleau-Ponty (2002), the notion of lifeworld (Husserl, 1973, pp. 168–179) becomes a lived experience through the body. Merleau-Ponty (2002), constructs his concept of *The Phenomenology of Perception* by conceptualising the lived body as working in and with the world—this is the lived body that has shaped my own lifeworld. Merleau-Ponty’s (2002), lived-body experience recognises the connection between body and mind that abstractly opposes mathematician René Descartes’s (1954) philosophy of dualism in the body–mind relationship. For Descartes, body and mind were constantly separate in their engagement with the world. I exist therefore I am in the world, but for Descartes, my mind is external from my body in the world. Descartes conceives a dualistic philosophy of body and mind that dismisses interacting with the environment through the senses to create thinking because of the bodies’ ‘unpresence’ in the world. For Descartes, the mind is mechanistic and separate from the body.

The intrinsic value of Merleau-Ponty’s (1964) eye *and* mind philosophy in this research is that it generates thoughts that originate in the embodied relationship in and with the world. Drawing in the cave studio became a method that theoretically acknowledges connectedness between eye and mind as philosophically distinguished from Descartes’s understanding of a separate dualistic removal of body and mind in relation to the world.

When I returned to the traditional studio (room 5.110, Edith Cowan University) from the cave studio, my initial research focused on the traditional techniques of etching and photoetching and their non-toxic alternatives in an attempt to contrast and compare aesthetic and visual difference between them. I asked the following questions: How might the traditional etching method of nitric acid etching compare with non-toxic alternatives such as saline-sulphate etching? How might the variations in aesthetic and material qualities challenge my visual perception of the marks and etched lines? How might such variants influence my understanding of the drawn subject? How might this in turn devalue or
enhance the meaning of the work? There appeared to be a lack of research that makes a
direct comparison of the two processes. The question of how these differences could affect
cognitive vision became apparent through practice.

Positioning Observations of the Real: Creative Practice in Context

Since the mid-1990s international research into non-toxic etching raised questions in
my own creative practice. Key investigators into non-toxic etching methods that enabled
the development of safer etching and photoetching include Cedric Green (Figueras, E. &
Kiekeben, F. & Green, C., 2004) Nik Semenoff (2009), Semenoff and L.W. Bader (Semenoff
2013). Semenoff (2009) completed innovative research employing copper sulphate as a
mordent for etching plates. While Howard (2003), author of The Contemporary Printmaker,
was one of the first practitioners to consider alternative ways of etching. Kiekeben (2003)
developed a new etching chemistry in collaboration with Paul Craig and Paul Rosenberg
from the Rochester Institute of Technology, New York (Craig & Rosenberg, 2003), resulting in
the introduction of the Edinburgh Etch process, which uses ferric chloride and citric acid as
a mordent in a vertical tank. I was a printmaking and etching technician for nine years and
a course leader for Artlab (an open-access printmaking studio) at the University of Central
Lancashire (2013), which also implemented this new non-toxic technology. The Centre
for Fine Print Research (Hoskins, 2012) continues this concern for innovative research,
collaboration, interconnectedness and networking. Hoskins’s efforts through such work
have led to recognised strategies for addressing complex problem solving in the field of
printmaking, most recently responding to rapid developments in contemporary 3D print
(Hoskins, 2013).
Seeing Like Computers

This section discusses the impact of the integration of digital technologies into visual culture in relation to how images are viewed in our contemporary culture. The impact of digital technologies is framed in relation to the construction of realities through the digital ability to manipulate images. Referring to the then newly animated hyperreal children's films, Mirzoeff (1998) noted, “it seemed that audiences were learning to see like computers” (p. 11). In the context of the relationship between seeing and knowing, and framed by Merleau-Ponty’s (2002) concept of phenomenology, Mirzoeff’s (1998) uses term ‘digiteyes’ (p. 13), which is an absorbing concept because it considers the direct effect of digital technologies on human identity. Scholar Gillian Rose’s (2007) research analyses social practices behind embedded images in contemporary visual culture and draws on Mirzoeff’s notion that “we interact more and more with totally constructed visual experiences” (p. 4), which supports Mirzoeff’s claim that postmodernity has severed the link between seeing and knowing. The present research moves between the gap of the seemingly severed link between seeing and knowing, a severed link which is instigated by digital technologies. If the link between innate vision and knowing could be re-established it marks the possibility of an entire new vital dimension in viewing the world. My own creative-research outcomes, which were shown in the exhibitions Eyes Open (i): Drawing in The Dark (Robinson, 2014i) and Imperceptible Realities (Robinson, 2015t) manifested as 2D and 3D prints that emerged from traditional and digital technologies in an attempt to challenge contemporary habits of viewing our world through pixels.

I cannot dismiss the resemblance of pixels to the postmodernist grid (Krauss, 1979). This resemblance is evident in the work Looking through Pixels (Robinson, 2013d) (Figure: 46, p.131). The grid aligns to pattern results of my glaucoma test; the removal of squares in the image is a metaphor for viewing the world through the pixel. The blocked squares represent
the point at which the field of vision is compromised. The grid looks into the world behind it in the form of a charcoal drawing of limestone rock formations found at Point Peron (WA). This pictorial device suggests that our habit of viewing the world through pixels compromises us because the underlying charcoal image is difficult to see. The square grid pattern from my glaucoma test suggests that digital technologies influenced my ways of seeing. Art critic John Berger (1972) questioned the way we look at and perceive art, believing that we look at things in relationship between those things and ourselves.

Figure 46: Robinson (2013d), Looking through Pixels, arches, charcoal on tissue paper, 56 x 77 cm. Photographer: Sarah Robinson.

The work Looking through Pixels (Robinson, 2013d) elucidates art critic Rosalind Krauss’s (1979) notion that “development is precisely what the grid resists” (p. 50) because Looking through Pixels (Robinson, 2013d) does not have the conceptual capacity to develop further than its recognition of the grid as “[a]n introjection of the boundaries of the world into the
interior of the work; it is a mapping of the space inside the frame onto itself” (p. 61). The space created by the glaucoma ‘grid’ in one sense mapped over the drawing underneath to create a new grid of blackened squares, as the grid laid over itself. Looking through Pixels (Robinson, 2013d) was Krauss’s (1979) “antinatural, antimimetic and antireal” (p. 50) grid. If one considers the notion of the grid placed over another grid, it becomes clear that other kinds of conceptual grids have been continually theorised. For Krauss’s (1979) flat grid seemingly investigated “crowding out the dimensions of the real” (p. 50); nonetheless, the development of 3D computer meshes changes that notion. The added third-dimension of the z-coordinate in a volume pixel now describes the real in a realistic way by defining a location of an object in 3D space on the computer screen. The extrusion process in 3D printers occurs through a nozzle in an x or y grid dimension and the z vertical axis (in effect) suggests the notion of filling up a virtual space, replacing the virtual object with a physical reality that (in effect) has recreated something else.

In my work in progress Re-transitioning into Three Dimensions (Robinson, 2013h) (Figure: 47, p.147), the moveable-arm scanner sweeps over the original potato print—in real time—scanning data from the object into Polyworks computer software, which directly constructs the digital grid in 3D on screen. In the process of Re-transitioning into Three Dimensions (Robinson 2013h), Krauss’s (1979) grid no longer “crowds out the dimensions of the real” (p. 50) and the grid is no longer “a way of abrogating the claims of natural objects to have an order particular to themselves” (p. 50)—it appears for Krauss (1979) that the grid is “[i]n a world apart and, with respect to natural objects, to be both prior and final” (p. 52). The upgraded technology from iPhone to engineering scanner required specific expertise to clean up the digital mesh, known as a manual edit, to enable the 3D printer to access the digital information from a standard tessellation language (STL) file. This type of computer file describes the surface geometry of a 3D object that creates the mesh.
Figure 47: Robinson (2013h), *Re-transitioning into Three Dimensions*, scanning and preparation for 3D printing, life size. Courtesy of Dr Kevin Hayward, Edith Cowan University Engineering Department, Perth.
The word ‘rhizome’ had been carved into a potato. From a template of letters reversed from a digital computer font. The heights of the letters were checked for printing clarity by pressing the cut potato into ink and transferring the ink onto paper. This affirmed the correct depth of cut; from a traditional printmaking process that referenced the historical potato cut print technique. The starchy potato was then scanned and printed in 3D. In this work, a starchy potato became a 3D plastic copy through a photogrammetry process that created a mesh, a computer grid. The photogrammetry process aligned the original form of the potato that had adhered it to nature to the digital realm. Across disciplines a Deleuze and Guattarian (1998) assemblage was achieved by tracing the original word ‘rhizome’ onto a potato and through a scanning process a digital aesthetic was created from the potato that could be stored indefinitely in the network of cloud computer servers. Inadvertently a partnership between an artist and an engineer created a simulacrum of a potato. In the three-level hierarchy of the Plato (trans. 2007) model, the hand-cut potato became the copy; the construction of a virtual computer mesh became a copy of the copy, as the ABS plastic 3D potato print possibly became the simulacrum. Through this process, a humble potato metaphorically sought out the territory that lies between non-toxic and toxic printmaking. I wondered whether the 3D potato print could be defined as non-toxic given that the 3D printer manufacturer states “Fortus systems don’t produce noxious fumes, chemicals, or waste” (Stratasys Incorporated, 2011). I also wondered if this 3D print of a rhizome could be constructed using food 3D printing technologies to create an edible simulacrum. As simulacra precedes the real, and in turn might cause the original to no longer to exist, the question of what is real, virtual or simulacra turns full circle.

The act 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 had a negative effect on translating this material aspect of the potato into suitable computer code to be sent to the 3D printer because once translated the data was simply too great a digital
aesthetic for the software to handle. The engineer Dr Kevin Hayward made a critical decision and separated the rhizome text from the main body of the potato mesh to clean up the digital information before reconstructing the whole potato. I did not anticipate that the furry cells held inside the raised type ‘rhizome’ would hold the material quality of a potato. I would rather have left the type rhizome, as it was, a truer representation of the original potato. The 3D potato print was not a true copy as I had envisaged; instead, it was a copy compromised by the digital aesthetic. My observations of the continuum from original potato through to the 3D printed copy raised questions. The transformation process from potato to 3D print questioned how the rhizomic concept metaphorically related to my creative praxis.

The meshes created from the photogrammetry process became conceptually important to my creative practice because the 3D meshes replaced the grid. The digital software employed for 3D printing is fractal based; its origins lie in Descartes’ (1954) Cartesian theory. As the originator of the Cartesian coordinate system, (a system that provides a tool for many contemporary disciplines that use geometry-related data to process information) Descartes (1954) used two lines to form an axis from which any 2D point could be located. This gave rise to the term Cartesian axis. The mathematical connection between Descartes’ crucial theory and contemporary computer software for 3D print influenced my experiments with 3D print. I employed computer programmes that have employed the vertical third-dimension z-axis to define objects in 3D space in computer software that attempt to accurately copy the real. Descartes’ Cartesian Theory is recognised as having a profound position in identifying reason in the unknown because the Cartesian coordinate system provided a tool—which used geometry related data to process information—as a method for philosophical reasoning. For me the coordinate system behind computer photogrammetry software offered a creative way to develop work from the unknown to the known (Sullivan, 2011).
Fractal geometry is scientifically credited as a way to better understand our reality because it can mathematically describe nature in the real world (Goodchild and Mark, 1987). Discovered by mathematician Benoit Mandelbrot (1983), the fractal is a mathematical property used to describe the principle of self-similarity across different scales. This similarity at different scales is an inherent property of the fractal—the fractal is a reduced-size copy of the whole property. The essence of this idea resonates in Parrott’s (2012, p. 79) work *Loop and Return* (Figure: 30, p.92). In this work, the fractal is represented not only in nature by the ram’s horn but also in 3D print copy. Another example of a fractal is the way a shell grows; it is the same shape whether small or fully grown—consider the structure of the suspended *real* shell in *The Confoundedness of Being in a Fractal World* (Robinson, 2015i) (Figure: 82, p.108).

Shapes viewed in the natural world do not conform to regular Euclidean geometrical shapes but Mandelbrot’s (1983) fractal opened up a new way in which natural aspects of the world are notated mathematically. This concept impacted on my practice in the development of the works *Rock Fractal* (Robinson, 2015z), *Telltale Visualisation* (Robinson, 2015ah) and *Carboniferous Fractal* (i) (Robinson, 2015f) (Figure: 48, p.137), which began by viewing the structure of the Carboniferous rock forming limestone cliffs at the fieldwork site in the Mendip Hills.
A specimen of carboniferous limestone rock (Figure: 51, p.138) collected from the cliffs in Cheddar Gorge (UK) (Figures: 49 & 50, p.138) appears the same in structure from afar as it does close up. The rock specimen is a fractal in the same geometrical essence as observed in the cliff face from whichever distance either is viewed. The rock specimen is cube-like because the cliff it came from fragments into cube and faceted 2D pixel-like structures. The cliff face visually resonates with a grid (Krauss, 1979) eroded along vertical and horizontal cracks. Acid rain weathering shapes this typical geological structure of limestone rock.
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Figure 49: Robinson (2015am), *Carboniferous Limestone Cliff*, Cheddar Gorge, (UK). Photographer: Sarah Robinson.

Figure 50: Robinson (2015am), *Carboniferous Limestone Cliff*, Detail, Cheddar Gorge, (UK). Photographer: Sarah Robinson.

Figure 51: Robinson (2015an), *Carboniferous Rock Sample*, collected from Cheddar Gorge, (UK). Photographer: Sarah Robinson.
I started drawing this rock specimen. I had selected it. I held it. Only after I spent some time handling the rock did it change in appearance. This was in part due to the oils from the palm of my hand because I turned it over and over while drawing it to reveal the imbedded carboniferous shells. The left-hand print, *Rock Fractal* (Robinson, 2015z) (Figure: 48, p.138), reveals the tradition of etching and reversal of the image through a physical process.

The print on the right *Carboniferous Fractal* (Robinson, 2015f) (Figure: 48, p.138) is a digitally rendered mesh resulting from uploading photographs from the original carboniferous rock sample into the photogrammetry software Agisoft PhotoScan. The mesh became distorted in the computational process because the program did not collate the points of reference in the original photograph. I suspect this was because the tonal contrasts in the rock sample were too similar. This led to protuberances in the mesh forming random ‘digital blobs’ outside the original defined area of the rock. These digital blobs (Figure: 52) fascinated me and reminded me of Polke’s (1998) conceptualisation of mistakes found in mechanical printing.

![Image of photogrammetry mesh](image-url)

*Figure 52: Robinson (2015ao), Screen Capture of Photogrammetry Mesh, from a Carboniferous Rock Sample from Cheddar Gorge (UK). Photographer: Sarah Robinson.*
A fractal grid revealed through the contemporary 3D print process represents a new way to explore the space between the original and copy that I investigated in my studio practice. The digitally constructed mesh is a copy from the original; it is a digital copy, the data for which is held in the computer. An example of the fractal grid appears in the screen capture (Figure: 52 p.139), which was taken from the carboniferous rock sample (Figure: 51, p.138), a detail selected from the captured image was used as a silkscreen (Figure: 53).

Figure 53: Robinson (2015ap), Fractal Rock, Detail: silkscreened on Hahnemühle paper, 56 x 76 cm. Photographer Sarah Robinson.
Perceptual differences between observing digital and original images reminded me of Sullivan’s (2010) “changing conceptions of vision” (p. 16), which states that it is “the brain that sees, not the eyes” (p. 19). The visual process has encouraged cognitive rapport within the context of the digitalisation of images in the world. Through the digital images achieved within the process of scanning or conjoining views of the same object through photogrammetry technologies, I came to realise a different way of seeing that could perhaps lead to different understandings for my printmaking practice.

For Coldwell (2001, p.3, 2008) there existed a conceptual gap between digital and traditional printmaking. Coldwell suggests that the artist may at times unknowingly make artistic decisions with the click of the computer mouse, for example, when preparing photopositives. It is very easy to transverse forward and backward over an image using edit tools. Coldwell seemingly suggests the involuntary movement of the computer operators mouse may precede the eye. Coldwell’s observation highlights how easy it would be for a computer to inadvertently control the artist’s decision making—perhaps expressing the fear of technology taking over both the image-maker and the image’s physical materiality. It seems that the computer has fulfilled poet-philosopher Paul Valéry’s (1964) proposition that “we shall be supplied with visual or auditory images, which will appear and disappear at a simple movement of the hand, hardly more than a sign” (p. 226). The touch screen iPad technology is a contemporary testament to Valéry’s prediction of images appearing and disappearing with the slight of the hand suggested by Valéry in 1964. While contemporary printmakers playfully exploit digital technologies and combine them with traditional techniques, discovering inventive ways to produce hybrid prints. A sense of the inventive is evident in artist Katsutoshi Yuasa’s (2012b) work *Listen, Nature is Full of Songs and Truth* (Figure: 54, p.142).
Yuasa’s (2012b) prints create unique visual resonance by transferring a digital photograph onto a traditional matrix that is then meticulously cut in the Japanese tradition of woodblock. This provides images with ethereal qualities as a direct result of cutting out the detail of the digital pixel-based image. Some prints display the telltale-banded lines representative of printing the digital image onto inkjet acetate in preparation for transferring the image onto the woodblock. The ethereal nature embedded in the print occurred through translating the banding of the printer because these bands disrupt the image in a manner similar to that which occurs when an analogue television is turned off and momentarily leaves banded lines flickering on the screen. Yuasa’s (2012b) _Listen, Nature is Full of Songs and Truth_ is an example of innovative research into how digital technologies can integrate and at times, supersede traditional printmaking practice, creating a completely different vision, which moves beyond a hybrid print into its own being. Yuasa (2012a) states, “My purpose of using a photograph is to be visible [sic] something which is perceived but no one sees” (para. 2).
Yuasa uses photographs in manner that is very similar to the images revealed by a microscope, a technological advancement in its own time that enabled the seeing of things otherwise unseen. Yuasa (2012c) states the following:

The whole process of woodcut is a [sic] important part of my concept. I respect craftsmanship of the traditional printmaking technique while I use a digital camera and a computer. I believe there are potential possibilities of creating the new work between handwork and digitalwork [sic]. (p. 13)

In part, Yuasa is expressing an essence of what it is I am trying to achieve in my practice. Technological advances present an intriguing technological opportunity for artists to work with. Yuasa (2012c) notes “It would be said the abstract reality or the real [sic] abstract because it contains both of objective and subjective perceptions and interactions between light and I [sic]” (para. 3). This statement is in line with my research objective, which is to explore how visualisation of given physical objects is changing with ever-present technological advances.
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The Cave Studio

Figure 55: Robinson (2014v), *Crystal Cave Drawing*, Yanchep National Park (WA), charcoal, pencil on Somerset paper, 50 x 70 cm. Photographer: Sarah Robinson.

The studio is a gritty limestone cave. Stalactite straws hang from the ceiling, and pathways are artificially lit to the right hand side of the cave pool and exit. Intense artificial light from LEDs illuminates the back of the cave. In the foreground, shadows reflect in the pool, which is a man-made construction. Visitors perceive it to be deep enough to drown in but it is not deep. A recovery plan adopted by the Australian Government Minister for the Environment for threatened Flora or Fauna, was drawn up by Val English, Edyta Jasinska, and John Blyth, (2003) who recommended artificially re-flooding the cave and constructing this artificial pool (Figure: 55) in the centre of the cave to enhance the aesthetic experience for the visitor and to encourage root mat or *mesh* growth. This pool is a simulacrum, a weak copy of the original. I began to question the validity of actions and interventions such as these, referring back to the reconstruction of Lascaux II, III and IV (Conseil départemental de la Dordogne, 2014) and the reasons for which companies specialise in constructing digital copies of heritage sites and artworks.
Imagine you are 20 feet underground in this limestone cave. You turn your head torch off and cannot see your hand held up to your face. After three days drawing, photographing and projecting images in the subterranean environment, the subtle impact of this immersion becomes apparent to my body and mind. I learn that caves breathe; they exhale at night and inhale in the day as the atmospheric pressure changes.

A charcoal and pencil drawing lies on the sandy cave floor. The drawing is of a pool and its reflections; it is drawn on Somerset handmade paper, and represents work undertaken in moments of complete isolation and silence. The specificity of the Somerset paper is relative to the Mendip Hills (UK). Water running through the cave system of Wookey Hole Caves, etched under the Mendip Hills, is used in the Somerset paper’s manufacture. The subdued, pressured, humbled, privileged, and mentally challenging immersion within the unique subterranean environment of the Crystal Cave, Yonderup Cave (WA) and Wookey Hole Caves (UK) subtly informed my praxis.

In the sense of questioning and developing humbled, privileged and powerful insights of the physical world, the immersive experience offers much for creative practice. A parallel lies between my immersive experience underground that resonates with contemporary artist Dorothy Cross’s exhibited work Stalactite (2010b), filmed in Doolin Cave, Ireland. This film captured the nuances of a soprano voice emitting non-verbal sounds under the Great Stalactite of Doolin Cave. A Giclée digital print Stalactite (2010a) (Figure 56, p.146) derived from the original film (2010b) captures an embodied experience and essences of a geological form entirely in one still image. Cross’s digital film and giclée print are both digital outcomes whose origins lay in capturing a moment of a profound experience.
For Irish Museum of Modern Art curator Rachael Thomas (2014) this experience is summarised as one in which “Dorothy Cross encapsulates these ideas of experiencing the world by exploring the materiality treasure trove the relationship of immersive space and the abstract world of our imagination” (p. 34). Perhaps it is the immersive approach itself that informs Cross’s *Stalactite* (2010 a, b), that is so important irrespective of differences in digital output. The cave for Cross acts as an immersive site to investigate the sublime materiality of geological time and is a method of investigation that privileges immersion over digital seeing.

My embodied experience of the WA and UK cave structures had a profound sense of immense geological time and power that brought me to tears. For this reason, Cross’s work resonates with my own immersive experience in caves. When you find yourself in a pre-reflective state deep underground it becomes difficult to escape the importance of Plato’s (trans. 1871) cave allegory. How did Plato’s theory apply to me as I attempted to unravel notions of observing the real? Plato’s Cave is a philosophical text presented as a dialogue; it is also a lesson in conceptualising the way we think.

Figure 57: Yendell (2014a), Panorama of Yonderup Cave, Yanchep National Park (WA). Photographer: Ian Yendell.

Consider the cave in Figure: 57 and imagine the following scenario: you have always been chained up with a group of other people facing this cave wall, so you cannot move your head; your head remains static, forever staring forward. Unknown to you, a fire is lit, raised up behind a parapet. On this parapet, people walk carrying objects so that only the reflections of the objects project shadows on the wall in front of you—any noise appears to emanate from these shadows. Plato (trans. 1871) argues that these shadows represent your reality because that is all you cognitively know. Perhaps you see this shadowy creature (Figure: 58, p.148)—this is your understanding of the real—you may even choose to name it—let us say Embryonic Crangonyctoid.
Figure 58: Robinson (2015aq), *Embryonic Crangonyctoid*, projected digital image of 3D print Crangonyctoid, life size, Wookey Hole Caves (UK). Photographer: Sarah Robinson.
Suddenly you are released from your metaphorical chains. You turn around to stare at the fire behind you; your eyes are in pain: “unable to see the realities of which in [your] former state [you] had seen the shadows” (Plato, trans. 1871, p. 2) before you observed the shadows again, in this case the *Embryonic Crangonyctoid* (the projection on Wookey Hole Caves’ wall) before exiting the cave (Figure: 59). Returning to the surface, your eyes adjust to the changes in light and eventually focus clearly in the daylight. When I emerged from the cave, I felt a new understanding of things within myself. According to Plato’s (trans. 1871) cave allegory, I would be compelled to return underground to inform any fellow captives that I had changed the way that I think. Only by exiting the cave and experiencing the outside before returning to the cave would one then able to think that they know what the creature is. I did not see the *real* Crystal Cave Crangonyctoid before its likely extinction but I did acknowledge its existence from viewing the photographic image of it posted on the cave wall (Figure: 61, p.151) Plato’s (trans. 1871) cave allegory confers transcendence from not knowing what reality is to an intellectual realisation of what it is that you see, is your own reality. This undeniably affected my experience and in turn profoundly shifted my creative praxis.

Figure 59: Yendell (2014b), *Sarah Robinson Exiting Yonderup Cave*, Yanchep National Park (WA). Photographer: Ian Yendell.
Material Thinking in a Cave Studio

Carter’s (2004) material thinking refers to non-linear forms of thought that open up a hidden gap of unrecorded moments in creative research. For me, this meant entering the cave with no preconceptions of what my creative-research outcomes would be. Drawing became taxing in this subterranean environment; it re-addressed in my arts practice the difficulties of this haptic eye–hand thought process. The projected digital images onto the walls of the Crystal Cave (Figure: 60) intrigued the cave visitors, who stopped and passed engaging comments about what they could see. The process of projecting digital images seemed to enlighten them. I speculated about whether this was an awakening in their individual thinking or a reaction to the familiarity of viewing digital images. I came to the conclusion that any appreciation of the content of the projected image was overridden by a familiarity with the digital aesthetic.

Figure 60: Robinson (2014b), Cave Projection, Crystal Cave, Yanchep National Park, (WA). Photographer: Sarah Robinson.
For Merleau-Ponty (1964) the “eye is an instrument . . . it is *that which* [sic] has been moved by some impact of the world, which it then restores to the visible through the offices of an agile hand” (p. 165). My eye was affected by the Crystal Cave Crangonyctoid amphipod photograph (Figure: 61) that I had seen in Crystal Cave while participating in a guided tour to familiarise myself with the cave layout. A photographic record of a strange-looking creature with four quirky feet—this creature fascinated me.

![Image of Crystal Cave Crangonyctoid Amphipod](Figure: 61: Jasinska (2000–2003), *Crystal Cave Crangonyctoid Amphipod*, photograph in situ, Crystal Cave (Robinson, 2013). Photographer: Sarah Robinson. (Exception to copyright, *Section*: ss40, 103C. *Exception*: Research or study).

The Crystal Cave Crangonyctoid amphipod is listed under “Schedule 1—Fauna that is rare or is likely to become extinct as critically endangered fauna” (Jacob, 2015). It is likely or already has become an extinct Gondwanaland relic as a consequence of the falling water levels of
the Gnangara Mound (WA) aquifer (English et al., 2003) which fed water into the cave pools. I was moved by the impact of the Crystal Cave Crangonyctoid’s likely extinction and my new awareness of this creature’s past existence opened up my research to a different trajectory. The Crystal Cave Crangonyctoid image resonated clearly with a reminder that ignoring the greater issue of diminishing water levels could have a devastating effect on the minuscule. The Crystal Cave Crangonyctoid was once observed as physically existing, sustained in the root-mat meshes floating in the Crystal Cave pools. The recovery plan (English et al., 2003) most probably came too late for this creature; however, the quirky cave shrimp was imbedded within my consciousness. As my interest in finding out more about this cave shrimp grew, I was led to the work of researchers Martin Stegner, Torben Stemme, Thomas Iliffe, Stefan Richter and Christian Wirkner (Stegner et al., 2015), who discovered residual eye stalks in blind cave crustaceans, and claimed this was evidence that three species of cave shrimp had lost their visual brain over millions of years. The notion that these shrimps had adapted to total darkness, resulting in them having only residual eyestalks because their eyes were all but gone, captivated me. Will our eyesight change due to the influence of digital technologies? Whether our innate eyesight will change in some way predominantly depends on the extent to which we see through a technological digital lens. What is it like for ‘digital natives’ who have never lived without digital images? Potentially, the majority of images they perceive are manipulated in some way. These digital natives may no longer be able to distinguish between the real and digital representations of the world—losing the ability to focus visually on what is directly in front of them.

For Merleau-Ponty (1964), eyes are “our computers of the world” (p. 165) that operate within the world. Digital technologies can cause embodied separation from that world. This became apparent in the cave studio because my eyes had to look and move to reconnect me with the importance of being in the world. My innate vision reconnected and enhanced
production in my creative practice, which was beginning to rely on digital techniques alone. A digitalisation fuelled by the prominence that is given to this style of printmaking in the contemporary world.

**Drawing in the Dark: Lived Body Reacts to Light**

Something happened in Yonderup Cave (WA) when I drew images (Figure: 62) onto pre-prepared etching plates coated with photopolymer film (to which an image is usually exposed by ultraviolet light in the dark). I scrutinised the cave formations before I decided to turn off my head torch to *draw in the dark*. I had assumed that I would draw with my eyes open—I did not—I would close my eyes—why? There was no need to close my eyes, but I felt that my visual perception was clearer if I did. I was visually analysing the *real* cave structures in front of me but I was drawing the retinal image from memory, perhaps from a false truth.

![Figure 62: Robinson (2014w), Drawing in the Dark, indelible pen, ImagOn polymer, 63 x 29 cm. Photographer: Sarah Robinson.](image-url)
My immersive process collected data through drawing, photographing, recording and journaling my subterranean experiences. I use the term ‘data’ as all encompassing of the digitalised Cartesian world and consider my physical experience collected through my creative practice as data. On returning to the traditional studio, I asked myself what impact my immersive experience in the Crystal Cave, Yonderup Cave and Wookey Hole Caves had on driving my praxis.

I started to align my material process (Bolt, 2010) to Plato’s (trans. 1871) cave allegory. I was experiencing a cognitive shift in my visual perception through producing the work *Visible World; Intellectual World—Drawing in the Dark* (Figure: 63). I considered what might be established in my practice from this process of surveying my surroundings.

Figure 63: Robinson (2014x), *Visible World; Intellectual World—Drawing in the Dark*, photograph of cave formations, Yonderup Cave, Yanchep National Park (WA), indelible pen drawn on ImagOn photo polymer, 21 x 21 cm. Photographer: Sarah Robinson.

Immersion in the cave environment was undeniably an experience of a sense of timelessness. Academic philosopher Simon Blackburn (2007, Audio podcast) refers to Plato’s preoccupation of illusion and the *not real* by stating:
Change is a sign of illusion, it’s as if the real world is timeless and immune to change and the world of forms—for example—and again one can easily understand that on a mathematical model, what the geometer says about the properties of a circle—its timelessly true—that’s it—it’s fixed, it’s there in aspic, in amber, whereas of course most of what we’re dealing with in everyday life is inevitably stuff that changes as we change.

Blackburn reiterates Plato’s thoughts as a connection between change, subjection to time and illusion, and failure to be truly real. Does Blackburn mean knowledge change constitutes an illusion? Philosophical discourses (Camille, 1996; Massumi, 1987; Peterson, 2009) have recontextualised Plato’s Cave by suggesting that the allegory will not work in the postmodernist world. Plato takes a literal sense of what reality is—the sun is the truth and the cave shadows are not. Deleuze (1983) turns to Baudrillard’s (1994) fear of the simulacra turning into a non-truth while Rebecca Peterson (2009) argues that there is a place in our understanding for both real and simulacra. Peterson uses an example of how post-modern author Jonathan Rosen (as cited in Peterson, 2009, p. 60) wrote of having a greater spiritual experience from the virtual tour of a religious site online. Peterson (2009) attempts to invert Plato in the postmodernist world to a point where simulacra “leaves room for a diaspora of truth facilitators, gives access to concepts otherwise inaccessible to reality, and allows us control over our own realities” (p. 65). The idea of simulacra challenges Plato’s clear-cut distinction between truth (i.e., absolute truth) and non-truth.
Data Visualisation of the Real

At this point in my creative practice, I investigated notions of representing an extinct life form. The merit of representing the Crystal Cave Crangonyctoid in 3D print lay in further engagement with rapidly expanding 3D print processes available to negate notions of representation. The inaccurate aspect of 3D print was most appealing because it suggests a site of tension in practice between aspiring for highly accurate data visualisation in the 3D printed copy and inaccurate representations. This inaccuracy enhances notions of using our perceptions to interact with the world. As the instantaneous haptic feeling of scale and form were realised by holding the 3D print (Figure: 64), the inaccurate 3D copy of the Crystal Cave Crangonyctoid form heightened the viewer’s perceptions of holding a representation of an extinct life form.

For me, the quest for accurate highly digitalised representations of things is absorbing. I wondered whether it is possible to rely on our innate perceptions of the world.
This notion of a non-reliance and lack of being attuned to perceptual importance in interacting with the world suggested a link to the work of the scientist Bohm (2004). In the context of the relationship between art, science and religion Bohm (2004) states, “man’s essential illness today is his feeling of fragmentation of existence, leading to a sense of being alien to a society that he himself has created, but does not understand” (p. 37). Bohm (2004) acknowledges that science’s “perceptual contact with the world is largely mediated by instruments” (p. 40). Bohm (2004) claims our fragmentation of reality came “from attachment to habitual modes of thinking, perceiving, and action . . . to come into conflict with the structure of the fact as it is” (p. 44). Bohm (2004) suggested an alternate way of responding to things already known is by replacing them with his (2004) concept of structure as “being the essence of all experience” (p. 44) and openness in approaches to thinking led to the development of mixed realities and confused realities within my work.

Mixed Realities, Confused Realities

Experiences and my openness to the unknown world began to influence the materiality of my studio process in the form of experiments with Autodesk 123D Catch—an iPhone app used to create digital meshes suitable for producing a 3D print of the Crystal Cave crangonyctoid. This was a point in the research where contemporary arts practice collided with an iPhone app—photogrammetry technologies collided with creative-arts practice (Figure: 65, p.158). What impact would copying the extinct life form of the Crystal Cave Crangonyctoid have on notions of the copy? (Baudrillard, 1994). The use of the terms ‘original’ and ‘copy’ led me to experiment with notions of representation.
At different stages of developing the model, copy, and digital 3D print from the original photograph of the Crystal Cave Crangonyctoid I dealt with the representation of the crangonyctoid in different forms: photographic, digital, sculptural, 3D print, wax, and plaster (Figure: 66, p.159). My creative process led me to construct a midden of wax models—cast from the 3D crangonyctoid print—as I asked much in the context of different representations of an image, and clarified which representations were most important to me.

I constructed a copy of the Crystal Cave crangonyctoid (Figure: 67, p.160), which was suspended above a sheet of newspaper to photograph. The Autodesk 123D Catch iPhone app camera process requires matching digital images taken from the object and its background to render it digitally in 3D. By circling the model in two loops, forty camera shots were taken that were subsequently uploaded into the cloud. The computer processed 3D image took several hours to come back (Figure: 68, p.161). The processing time seemed too long for the inaccurate visual image received back to my iPhone and the material results achieved from 3D printing that same image.
Figure 66: Robinson (2015a), *Work in Progress*, wax casts from 3D Prints, size 7 x 5.5 x 1 cm, *Xanthorrhoea preissii* resin, steel plate, traditional smoked ground. Photographer: Sarah Robinson.
Figure 67: Robinson (2014n), *Sculpting and Photographing the Crangonyctoid*, clay model, photographic setup outdoors. Photographer: Sarah Robinson.
Eventually the computer generation of the 3D model was sent back to my mobile phone. I expected an accurate 3D print to be constructed from the Autodesk 123D Catch app and the Shapeways print process. I was intrigued to discover whether a mobile device was capable of rendering accurate mesh information to upload and send to the Shapeways online 3D Print Bureau (Figure: 68). It emerged that the mesh simply was not of a sufficiently high quality to produce the accuracy in the model that I had anticipated, even though the mesh was manipulated to an extent within the Autodesk 123D Catch app.

Figure 68: Robinson (2014d), *Crangonyctoid Amphipod*, screen capture from Autodesk 123D Catch app, uploaded to Shapeways online 3D Print Bureau. Photographer: Sarah Robinson.

Shapeways (2015) informed me that there were problems with the file and suggested I use their ‘print it anyway’ option. After using this option, the unexpected happened: the 3D crangonyctoid prints returned with the appearances of embryonic forms (Figure: 69, p.162) in which the fractal geometry is obvious in the 3D printed outcome but the clarity of the original image is not.
I was captivated by this visual 3D representation of something that was not sufficiently accurate to print—decided by Shapeways. I purposefully incorporated mistakes into my arts practice by clicking the ‘print it anyway’ button. It appears that in the field of data visualisation, for example in medicine, science and design, we are seeking representations of the world that accurately record the physical—as seen from the influence of the desire to record and preserve in some way the original historical monuments or artworks—by digital-heritage companies. Considering the possibilities of the ‘print it anyway’ option affected my material thinking, leading me to ask what is the importance of capturing reality by copying it. Instead of striving for an accurate copy of the crangonytoid I thought, ‘Let us take risks and diverge from this moment in my creative practice’. It was time to seek expert advice in data visualisation. I consulted with Associate Professor Paul Bourke (2014) from the University of Western Australia, who assisted me to create a visually stronger mesh to send to 3D print using Adobe Photoscan software (Figure: 70).

Figure 69: Robinson (2013b), Embryo, 3D ‘print it anyway’ from Shapeways online 3D Print Bureau. Photographer: Ian Yendell.

Figure 70: Robinson (2014c), Crangonyctoid Amphipod, digital print, developed from photogrammetry mesh edited in Adobe Photoscan software screen capture, Somerset paper, 56 x 76 cm. Photographer: Sarah Robinson.
This process created a far superior mesh suitable for the Shapeways 3D Print Bureau. The Crangonyctoid mesh legs had been refined; its antennae were separated and reprinted in clear nylon. The translucent body was intriguing to Bourke because he recognised the possibilities of printing colour inside such a form in a medical context. One example of the collaborative benefits of working across disciplines—in this case, a contemporary artist and a data-visualisation expert—is the ability to extend the creative possibilities across disciplines. The resulting 3D print developed through my creative praxis into the contemporary artwork *Fractal Possibilities of Being* (Robinson, 2014j) (Figure: 71), which was shown in underground in the cave exhibition Eyes Open (i): Drawing in the Dark (Robinson, 2014i) and in Becomings (Robinson, 2014a) (Figure: 72).

Figure 71: Robinson (2014j), *Fractal Possibilities of Being*, drilled LED lit Perspex cube with black thread mesh, 23 x 23 x 23 cm, Digital 3D print of Crangonyctoid amphipod, installed in Crystal Cave, Imperceptible Realities exhibition, Yanchep National Park, WA. Printed by Shapeways/Paul Bourke. Photographer: Ian Yendell.
Unwittingly, I had fallen into seeking an accurate representation of my original model of the crangonyctoid. The anomalies in the process itself informed my creative praxis through my attempt to analyse differences of innate human vision in an increasingly digitalised world. From Baudrillard (1994) to Deleuze (1983), Plato’s (trans. 1871) reality had been lost to the hyper reality of Baudrillard’s (1994) simulacra. Before I entered the darkness of the cave, I knew nothing of the shrimp-like Crystal Cave Crangonyctoid creature’s existence steeped in geological time. Perhaps the extinct amphipod subsequently has a new reality because of it being returned to the cave through a creative praxis.
While the crangonyctoid 3D print is a *copy* derived from a photograph of the *original* amphipod, the digital technical production of it enabled the realisation of Benjamin’s (1935) concept that states that “technical reproduction can put the copy of the original into situations which would be out of reach for the original itself” (p. 3). This realisation gave the impetus through creative practice to reintroduce the crangonyctoid into Wookey Hole Caves in the Northern Hemisphere (Figure: 73).

Figure 73: Robinson (2014k), *Humble Layering*, 3D crangonyctoid print, 3 x 12 x 16 cm, installed in Wookey Hole Caves (UK). Photographer: Sarah Robinson.

In an increasingly digitalised world, the original Crystal Cave Crangonyctoid itself was likely to be extinct but the digital copy of it was positioned against a stalagmite in Wookey Hole Caves (UK) for the creative work *Humble Layering* (Robinson, 2014k) Hemisphere (Figure: 73).
The plastic model created by man-made digital technologies visually contrasted to a stalagmite structure millions of years old: a structure rich in texture and form, exuding geological histories in the aura of geological time. The documenting of this *Humble Layering* focused my attention on structural differences between the stalagmite, and the man-made plastic print. In the context of the development of mathematics in relation to the perceptual field, it reminded me of Bohm’s (2004) validating *structure*. Structure for Bohm (2004) is the common ground between science and art, the moment that “mathematical expressions [are] originally regarded as *symbolizing* (p. 42; italics in original) the properties of real things” (p. 42) I liken this idea of mathematics symbolising real things to the structural meshes resulting from digitally copying the clay crangonyctoid form that was necessary to allow 3D printing. In the studio, metal telltales were positioned in randomly selected points where lines intersected from a projected image of the crangonyctoid 3D mesh (Figure: 74).

Figure 74: Robinson (2015al), *Work in Progress*, 3D crangonyctoid print, 3 x 12 x 16 cm, metal wedge, 3D photogrammetry mesh projection. Photographer: Sarah Robinson.
Telltales

In Crystal Cave, there were geotechnical telltales made from two thin glass sheets that transverse significant cracks in the rocks throughout the cave. Each telltale was numbered with a red disc. If any movement in the rock occurred, the glass would snap. Influenced by this conceptual tension, the work *Visualisation Will Be There in a Jiffy (ii)* (Robinson, 2014u) (Figure: 75) incorporated etched-copper telltale discs equivalent to the red-disc telltales in the cave. The concept behind creating these copper telltales warned against the metaphorical crack of relying on digital and not traditional ways of seeing. The etched-copper telltale discs were hung around glass jars, aligning the text *Visualisation Will Be There in a Jiffy* in chronological order to resonate with the different stages in development of the crangonyctoid 3D prints.

Figure 75: Robinson (2014u), *Visualisation Will Be There in a Jiffy (ii)*, left hand image: 3D prints, glass vessels, etched-copper plates, installed in Yanchep Cave, (WA). Right hand image: studio process. Photographer: Sarah Robinson.
My intention to photoetch text into the copper discs at different depths references the lengthy time required for the software to processes digital information in the cloud. A concept that ensued from a message received on my iPhone while waiting hours for the free iPhone Autodesk 123D Catch app to return an image of the radar tower on Secret Harbour Beach (Figure: 76) as part of the collaboration for the InConversation exhibition (Adams et al., 2014). I employed the notion that I had to wait to see for an indicator that visualisation would be complete soon.

The conception of the thread of text (Figure: 77) was split into six discs throughout the gallery space. The text ‘generating files’ is faintly etched into the first laser-cut copper disc; it spins in front of the work Airy Vision (Robinson, 2015a) (Figure: 78, p.169), creating reflections on the acetate image and on the floor below that glint with rippled light.

Figure 76: Robinson (2013g), Radar Tower, iPhone screen capture from Autodesk 123D Catch app. Photographer: Sarah Robinson.

Figure 77: Robinson (2013a), Artwork for CAD, copper disc production and photoetching positives, Adobe Illustrator. Photographer: Sarah Robinson.
Airy Vision

*Airy Vision* (Robinson, 2015a) (Figure: 78) depicts a geological formation that has taken millennia to develop: drip-by-drip. A watery feel is created over the solid presence of the painted *Airy Pattern*. The image’s true origin is revealed only when time is spent observing *into* and *through* the acetate. Depth is created by the gap between the wall and the acetate, which curves away from the wall. It takes time to view the barely visible black stalagmite shadows held in the digital acetate.

![Airy Vision](image)

*Figure 78: Robinson (2015a), Airy Vision, digital acetate, paint on gallery wall, 75 x 75 cm. Photographer: Ian Yendell.*
This target-like symbol was specifically located at the entrance of Spectrum Project Space to define the context of the exhibition Imperceptible Realities (Robinson, 2015r). The work, *Airy Vision* (Robinson, 2015a), was positioned to draw attention to the concentric rings, which refer to an airy pattern (Westerhoff, 2011, pp. 40–41). An airy pattern occurs when light is forced though a pinhole before diffraction occurs and scatters the light in rings onto a facing surface. Light behaves like a wave pattern and forms shadows of concentric dark and light rings through its projection onto a surface in this manner. This leaves a signifier (Saussure, 1972)—the airy pattern creating shadows—the material aspect of a sign that in this instant is the conceptual recognition behind the creation of an airy pattern. My exploitation of the target-like motif was an attempt to experiment with the airy pattern.

The materiality of the paint and the hand application of painting the underlying airy pattern gave this piece the visual quality that I sought in the juxtaposition of digital and traditional images. The observed stalagmite was represented within the digitised acetate that was disrupted by the airy pattern painted directly under the acetate onto the gallery wall. The disruption of the stalagmite image occurs from observing the airy patterns concentric rings, which unintentionally resemble the structure of an eyeball pupil. Momentarily, a breeze enters from the outside to spin the disc and move the acetate. The centre circle of the airy pattern becomes the pupil of the human eye, which refers to our perception—the locus of seeing—observing and scrutinising the world.
Suspended near the digital high-definition wall, the last telltale disc is etched very deeply with the text ‘jiffy’, which is fully coated in red spray paint. This disc—the last in the series of six discs that chronologically stated *Generating Files, Visualization Will Be There in a Jiffy*—is supposed to imply that some kind of visualisation has occurred.

Analysis of my relationships to the perceptual field continued to develop alongside studio processes influenced by Bohm’s (2004) consideration of the differences between science and arts that led him “to look with a fresh view at structure as [he] perceived it directly with the senses” (p. 47). The phenomenological experiences in the cave studio influenced a practice that gravitated towards alchemy, which meant using the traditional smoking of plates using lit wax tapers over bitumen toxic grounds. Studio processes were caught up in representations of toxicity, danger and rebellion—rebellion in the sense that my creative practice was pushing against a digital impact on traditions of etching practice to test my hypothesis of digital technologies interfering with innate human perception. Through the process of smoking etching plates to give them a rich black materiality, as black as the colour of pitch, alchemies close link to printmaking resonated with the practice of throwing phosphates onto the Wookey Hole Caves walls in the 1900s to illuminate natures wonder—the cave—through providing the momentary ability to see in the dark, if only for a few valuable seconds. These phosphorus marks are visible but barely seen in the work *The Hole* (Robinson, 2015r) (Figure: 79, p.172).
Figure 79: Robinson (2015r), *The Hole*, acrylic, digital acetate of *Xanthorrhoea preissii* grass tree, Wookey Hole Caves (UK), 75 x 75 cm. Photographer: Ian Yendell.
Summary

My studio existed in *spaces* between collaborative practices and in *unusual places* (the cave). The cave space was a purposely-unsettling space in which over-reliance on pixelated seeing often-preferenced human vision. Spaces in unusual places created through collaborative practices have the potential to dislodge further the relationship between digital and traditional printmaking. However, if such spaces can be enhanced and work in tandem with each other, there are advantages in creating new images, and a traditional printmaking process is invigorated, and “implies work that has sought a dynamic balance; [work that] is not safe, grounded on solid foundations, but looks to create an image that is more speculative, more risky—hopefully a little unsettling” (Coldwell, 2016, p. 2). In positing *The Unstable Image*, (Coldwell, 2016) as unstable, this notion validates images developing in my own practice. The unstable nature of the image opened up incredible opportunities for me to create new perceptual experiences. These perceptual experiences were exhibited in Imperceptible Realities (Robinson, 2015r). The following chapter attempts to critically examine and unravel Massumi’s (1987) proposition of the significance of the role of the digital in conceptually receding the world out of sight into the theoretical perceptual field.
Chapter Five

The Confoundeness of Being in a Fractal World
Chapter Five: The Confoundedness of Being in a Fractal World

Video 3: Robinson (2015s), Imperceptible Realities, 8 minute film documentation of PhD exhibition at Spectrum Project Space. Cinematography: Rusty Geller, Society of Cinematographers (SOC), Film Editor: Rakib Erick.
Introduction

This final chapter relates my irritation of the digital influence on traditional printmaking through the research outcomes *Imperceptible Realities* exhibition Robinson (2015s) (Video 3, p. 175), to Massumi’s notion of the digital being responsible for conceptually receding the world to a point where “Meaning is out of reach and out of sight” (p.90) which I recognised was happening—through my creative practice—as I aligned traditional printmaking processes with digital printing. To explore rhizomes of thought that affected my creative progress, the concept of materially became a device for me throughout which I could theoretically draw on the postmodernist grid’s transformation into the fractal world, through digital orientation of photogrammetry 3D meshes.

Massumi (1987) undermines Baudrillard’s (1994) simulacrum by expressing the view that while the simulacrum offers a coherent sense of the world inundated by copies, it does not offer a way forward as “We neutralize the play of energized images in the mass entropy of the silent majority” (p. 90). For Massumi (1987), Baudrillard provides a pleasureless world in which meaning “is out of reach and out of sight, but not because it has receded into the distance” (p. 90). Is the reason that meaning is “out of reach and out of sight” because the current physical world has been hidden in the digital?

The work *Carboniferous Fractal* (ii) (Robinson, 2015g) (Figure: 80, p.177) attempts to disrupt vision through the digital. It took some time for gallery visitors to comprehend that somehow the painted grey rock silhouette appeared to be imbedded in the cliff. This perhaps is because we expect to see in one flat digital plane. The visual effect in the work attempted to present the viewer with a succinct moment in recognising a double image—to ask why this perception may have disrupted their vision and assumed interpretation of the image.
A possible way forward in relation to the notion of meaning being out of reach and out of sight is demonstrated by Massumi’s (1987) analysis of Deleuze and Guattari’s (1997) concept of simulation. Simulating a real shell, the 3D printed work *Conus marmoreus Shell* (Robinson, 2015i) (Figure: 100, p.196) draws on resemblance and replication. The creative process of producing the large 3D printed *Conus marmoreus* shell was very different from nature’s production of this shell yet produced visually similar outcomes. Massumi (1987) states “Resemblance is a beginning masking the advent of a whole new vital dimension” (p. 91) designed to bring to focus how we might use successfully use digital technologies alongside innate human vision. Images of the world are continually seen through the pixel. A pixel stack aligns to the technique of selecting specific pixels from stacking digital images used in computer data analysis. Considering the concept of a pixel stack led me to create the work *Pixel Stack of Imperceptible Reality* (Robinson, 2014m) (Figure: 81, p. 178), which facilitated comparisons between the form and content of each pixel cube.
Figure 81: Robinson (2014m), *Pixel Stack of Imperceptible Reality*, nitric acid etching on BFK Rives, Hahnemühle, Somerset, acid-free linen tape, digital print on paper, newsprint, living grass sod, artificial grass, corrugated card, *Xanthorrhoea preissii* resin/leaves, Perspex, light boxes, 141 x 23 x 23 cm. Photographer: Claire Alexander.
The pixel stack is layered bottom to top as presented below.

*Pixel 1:* Contained a *real* living, breathing grass sod, extracted from a domestic WA lawn.

*Pixel 2:* A copy of the original grass sod constructed from corrugated card and artificial grass. A discarded, screwed up, photocopy from a 3D printed mesh taken from an earlier work *Rhizome: From the Studio to the Digital Cloud and Back* (Robinson, 2013k) litters the fake grass. A referent to digital computer mesh required for 3D print.

*Pixel 3:* Nitric acid etching formed into a cube, produced from a drawing of the artificial grass sod and litter below, on top of which is placed a natural plant form that is viscerally reminiscent of a fractal grid and mesh indicative of 3D printing.

*Pixel 4:* Nitric acid etching reinterprets the original form of the living grass sod below, with a *Xanthorrhoea preissii* resin ball placed on top. The natural blood-red colour of the resin suggests its potential toxicity and mirrors the potential hazards represented in an image exploring the material process of nitric acid etching on which the resin ball sits.

*Pixel 5:* Stopping out varnish has been used on a steel plate to blank out a drawing of the screwed up photocopy (refer to pixel 2), subsequently allowing the acid etching process to create the velvety black negative spaces in the background. Held in contrast to this the blacked *Xanthorrhoea preissii* leaves are placed on top, asking whether the leaves are in fact burnt. Why is this reality here?

*Pixel 6:* A delicate cap of hydrochloric bubbles track along a fractal grid, photocopied from a digital photograph of the nitric acid etching in process. The top of the stack where the chronological order of geological time is not always as it appears.
The rationale developed in this work of challenging perceptions in an increasingly digitalised world underpinned the installation plan for Imperceptible Realities (Robinson, 2015t) that was designed to encourage the visitor move around the work. *The Confoundedness of Being in a Fractal World* (Robinson, 2015i) (Figure: 82) was designed as the focal point of the exhibition.

![Image of The Confoundedness of Being in a Fractal World](image)

*Figure 82: Robinson (2015i), The Confoundedness of Being in a Fractal World, Perspex boxes, 3D prints, rotten potato, inkjet prints, photocopy/inkjet on rice paper, wax shrimps, 72 x 72 x 72 cm. Photographer: Ian Yendell.*
In utilitarian Perspex cubes that were used for *The Confoundedness of Being in a Fractal World* (Robinson, 2015i) (Figure: 82, p.180)—reflections or the double image appearing in the Perspex cubes are present only at certain angles in the work—traces of scientist and inventor John Henry Pepper’s (1890) illusory ghost, occur with visual enigmas of copies and more copies. Airy pattern dots and digital meshes inkjet printed onto rice paper became 3D physical matter. Mirrors reflect digital prints within the perspex cubes, and inkjet prints derived from rippled stalagmite forms found in the cave appear as mesh-like strands reflected in the mirrors placed in the bottom of the Perspex boxes. Digital prints are placed on the underside of the box lids—one is a print from a steel-plate etching that holds the tradition of a true velvety black as dark as the cave. A *Conus marmoreus* shell is given precedence in the centre of the top layer—a real shell acts as an imposter for the 3D print; it looks the same, yet is sculpted by nature not software. The suspended transparent 3D printed crangonyctoids were angled in space to reflected the x, y and z axes that define the 3D objects positioned in 3D space on screen; wires show through the Perspex boxes, which must be improved upon in future work because the wires visibility undervalue the work itself.

To work with physical objects’ relationship to x, y and the z-axis in space on screen, and to visualise and repair any holes in the photogrammetry 3D mesh, visual experiments with Blender software developed into a rational for examining the concept of *digital orientation* in my creative works.
Digital Orientation

Blender software was employed to check 3D objects manifold properties (before sending the digital data to the 3D printer). The sequential process of viewing the transformational changes of an object mesh became a determining factor in influencing the image reconstruction for *Pixelated Fractals* (Robinson, 2015w) (Figure: 83), which consisted of nine fabricated steel boxes that allude to the pixel.

![Image of Pixelated Fractals](image_url)

Figure 83: Robinson (2015w), *Pixelated Fractals*, detail, acrylic ink white photo-silkscreen on steel. Photographer: Ian Yendell.

To acknowledge the traditional etching process the folded fabricated steel sheet retains the pencil markings that signify a trace of a skilled tradesperson. Each steel box is identical and it is likely that the water-based acrylic photo-silkscreened images—digital geometry pattern
fragments taken from a *Conus marmoreus* shell 3D mesh (Figure: 84 & 85, p.184)—applied to the steel box surfaces will continue to change the digital image, as it oxidises and rusts. For Coldwell the image “is not safe, grounded on solid foundations, but looks to create an image that is more speculative, more risky—hopefully a little unsettling” (Coldwell, 2016, p. 2). The digital can create speculative images that conceptually offer unstable territory as posited by Coldwell (2016, p. 2) but from a wholly material perspective, unstable, in that steel boxes rust. This led me to ask what is our true perception in observing the material interface that preferences neither digital nor traditional printmaking methods in creating unstable images.

In the first stage of mesh visualisation Blender software selects all the normal triangular facets creating an objects mesh (in this case a *Conus marmoreus* shell) which appear in an orange (Figure: 84) wire-frame outline containing a square dot in the centre of each triangular facet.
The second stage in the mesh-repair process requires selecting the *normals*—a vertex that emanates from the centre of each triangular face—in the mesh, meaning that the selection process visualises turquoise blue lines emanating from the centre of each facet or plane (triangle or square). These blue lines on the outside of the fractal grid indicate the correct orientation of the individual mesh face as seen by the viewer. If the object had a flat base and was viewed from underneath by rotating the object on screen, these blue lines would be absent. Likewise, if the object was viewed from the inside (refer to the fly through in the work *Exteroception (Re-representation of an Original Shell from Inside Out)* (Robinson, 2015p) (Video: 2, p.101), the blue axis (sticks) present on individual facets inside the 3D shape, would indicate that the individual triangular facet was oriented upside down. The blue stick or axis faces *into* the 3D shape, rather than on the outside of the 3D object, and must be flipped back so the line is oriented on the *outside* of the object—making the mesh manifold. A consequence of employing Blender software in the visualisation at different stages in the mesh repair process was its ongoing influence in studio process.

Figure 85: Robinson (2015d), *Blue Axis Selection*, screen capture from Blender software. Photographer: Sarah Robinson.
The concept of flipping individual fractals reminded me of the concept of the mirror image in etching plates, when cognitive energy is realised through drawing the reverse image if the intention is to view the completed print with the original drawing the correct way. Understanding the process of reversing individual facets in the 3D mesh that are disoriented on the screen was complex for me. I decided to undertake physical experiments (Figure: 86) by bending and reconstructing inkjet paper prints facet to facet.

![Bending Fractals](image)

Figure 86: Robinson (2015c), *Bending Fractals*, studio process. Photographer: Sarah Robinson.

This experiment proved unsatisfactory because the process was falling into entrenched ways of practice by appropriating old digital images from earlier stages in the research. A different approach was needed that would be able to connect colour clues from the shell’s 3D screen mesh. Constructing 3D orange and blue wooden squares, with similar coloured blue and orange axes protruding from them, was another way for me to understand what I was seeing on the computer screen (Figure: 87, p.186). The necessity to return to the haptic relationship with a physical object to heighten my understanding of a digital process on screen was reassuring in light of the possibility the digital aesthetic interferes with our innate perception.
Influenced by my actions in and through my practice with Blender software, the orange and blue wooden sculptural tests were backed with nitric acid etched images in steel plates (Figure: 88, p.187). This work connected through its materiality to the turning away from traditional etching techniques—the etched steel plate—preferred by the digital—the blue spikey backing.
In attempts to resolve the digital orientation of facets in the computer software, my visual attention was quickly turned to the hair-like patterns that the Blender selection processes created. An interim process was required for selecting the inside of these marks using Adobe Illustrator, to provide the necessary data for a laser cutter to read the digital information (Figure: 89 & 90, p.188), and incorporate the digital aesthetic derived from the original shell into the works *Antithesis* (Robinson, 2015b) (Figure: 91, p.188) and *Blue Fractal* (Robinson, 2015e) (Figure: 92, p.188). This process necessitated creating a liaison with a specialist plastics company. The orange laser-cut acrylic references the selected geometry from the original shell; the blue laser-cut acrylic indicated facets facing the correct way.
Figure 89: Robinson (2015ab), *Selecting the Digital Orange*, screen capture of information for CAD printing. Photographer: Creative Plastics.

Figure 90: Robinson (2015aa), *Selecting the Digital Blue*, screen capture of information for CAD printing. Photographer: Creative Plastics.

Figure 91: Robinson (2015b), *Antithesis*, laser-cut acrylic 20 x 20 cm. Photographer: Ian Yendell.

Figure 92: Robinson (2015e), *Blue Fractal*, laser-cut acrylic 20 x 20 cm. Photographer: Ian Yendell.
In my practice, properties of digital orientations on screen had conceptually driven deeper the notion that there is a possibility that the square pixel has superseded the circular lens in visual interactions with the world. Traces of the circular lens remained evident in bare steel in the work *Waiting* (Robinson, 2015ai) (Figure: 93). Marks leftover from the materiality of traditional wax-smoked ground that emanated a pitch-black cave-like darkness around the bare steel etching plate leaving a circle. A viewing portal or hole left in the ever-changing surface seemed unstable but with future potential to be drawn on and etched once more. A concept that embraced a dormant potential for the plates to be drawn on at any time with an etching needle—or for the traces of time to add random marks to their surface—as the prepared etching plates remain in limbo at the point between the traditions of etching and the digital aesthetic.

Figure 93: Robinson (2015ai), *Waiting*, steel etching plates prepared with traditional smoked ground 152 x 152 cm. Photographer: Sarah Robinson.
In the work *Waiting* (Robinson, 2015ai) (Figure: 93, p.189), the straight horizontal and vertical cracks between the etching plates form a postmodernist grid that is intentionally placed directly in front LED light grids and grids formed by the layout of mirrors in the work *The Confoundedness of Being in a Fractal World* (Robinson, 2015i) (Figure: 82, p.180). In this work the postmodernist grid revealed itself at the moment the LED lights placed in the bottom of the appropriated utilitarian Perspex cubes were switched on—to reveal a lit grid along the edges in the work *Studio Process-Cube* (Robinson, 2015ac), (Figure: 94).

![Image of Studio Process-Cube](image)

*Figure 94: Robinson (2015ac), Studio Process-Cube, Perspex cube 24x 24 x 24 cm, 3D Crangonyctoid print, etched-copper disc, red spray paint. Photographer: Sarah Robinson.*
A significant experimental process then began in the studio (Figure: 95). This process drew theoretically on the postmodernist grid. Different configurations of the grid developed with the light boxes. Bohm (2004) states that a superior way to approach investigations is to “‘feel out’ and explore what is unknown, rather than . . . leading to modifications, extensions or other developments within the framework of what has already been known” (p. 48).

If this notion is true, then this approach was serendipitously developed through the studio process. Experimental rearranging of steel boxes experimented with fractal-grid meshes digitally printed onto rice paper that would become confined in the Perspex boxes (Figure: 96, p.192).

Figure 95: Robinson (2015af), Studio Process-Gridded Light, experimenting with installation concept of gridded light, steel boxes, digital prints on rice paper, CAD blue/orange acrylic maquette, appropriated Perspex boxes. Photographer: Sarah Robinson.
The grid (Higgins, 2009; Krauss, 1979) is referenced by the alignment of the six monitors of pixelated screens that held a presence in the Spectrum Project Space (ECU) by their sheer scale. This grid structure (formed by screens) resonated with the grid structure formed by the alignment of square traditionally prepared steel etching plates in the work *Waiting* (2015ai) and the LED lights defining the Perspex edges of the Perspex cubes, which created an infinity grid in the work *The Confoundedness of Being in a Fractal World* (Robinson, 2015i) (Figure: 82, p.180). The high-resolution digital wall was selected to play the animation because it was reminiscent of the screens seen everywhere in the contemporary world (e.g., at airports, schools, and in other public spaces) and anticipated the technological distance from observing the *real* this choice of presentation would cause. The origins of the work *Exteroception (Re-representation of an Original Shell from Inside Out)* (Robinson, 2015p), (Figure: 98, p.194) presented on the high-resolution digital wall lay in studio process in developing a *Line from Real to Unreal* (Robinson, 2015u), (Figure: 97, p.193).
In the studio, I constructed a visual narrative to determine the continuum from original to copy by pinning to the studio wall an image of Rembrandt’s (1650b) *The Shell* etching on the left-hand side of a line—designed to be read from left to right— that followed through a series of different representations derived from a *Conus marmoreus* shell. This included a high-resolution inkjet image of Rembrandt’s *The Shell* print downloaded from the Rijksmuseum, (2012) through to creating digital screen captures of the shell’s digital mesh created in Blender software, and creating 3D prints of the crangonyctoid exhibited to the right-hand side of the linear visual narrative. This studio process unfolded and plotted the transformation from the case-study observation of the original Rembrandt shell etchings to digital representations of the shell through the Agisoft PhotoScan and Blender software used to understand 3D print processes and create them.
Imperceptible Realities

The notion of the transformation from original to copy and 3D simulacra became the conceptual underpinning for the short animation *Exteroception (Re-representation of an Original Shell from Inside Out)* (Robinson, 2015p), which was displayed on the digital high-definition display wall (Figure: 98).

Figure 98: Robinson (2015p), *Exteroception (Re-representation of an Original Shell from Inside Out)*, 6 minute loop animation, digital high-definition display wall, 100 x 80 x 250 cm. Film editor: Rakib Erick. Photographer: Ian Yendell.
The transitions between traditionally and digitally produced images occur as one image morphs into the other—the boundary between original and copy is blurred as the transition period between the images in the film momentarily defines the tension between digital and traditional printmaking. There is always a sense of flux. The screen displays the visual transformation from Rembrandt’s shell etching where all copies of the print become equally digitalised—devoid of texture and the mark of the real. The most revealing point occurred as one digital image crossed into the other (Figure: 99).

Figure 99: Robinson (2015ak), *Work in Progress*, screen capture, Adobe Premiere. Photographer: Sarah Robinson.

It seemed the digital wall in the work *Exteroception (Re-representation of an Original Shell from Inside Out)* (Robinson, 2015p) (Figure: 98, p.194) caused great interest for the Spectrum Project Space visitor, in itself. I noted a keen response from the gallery visitor to the techne (Heidegger, 1977) of the digital high-definition wall. This man-made grid of screens displayed a high-resolution digital otherness in that people’s attention was far from contemplating the on-screen image or the content displayed on screen. Gallery visitors seemed impressed by the wall itself, rather than by the content it displayed or the experience of looking at the film while holding the 3D shell print, which were designed to engage with the haptic and visual experience at the same time. The technology of the Agisoft PhotoScan software creates the ability to fly through the interior of the digitally rendered original *Conus marmoreus*
shell. This technology can achieve a sense of movement, a sense of travelling inside a shell—a notion that perhaps Rembrandt could only ponder. The final lingering image on the digital screen represents the mixed-up texture of the original shell pattern—caused by the processing of the software program file that was returned to me after attempting to upload a texture PNG file—a digital file which was necessary for ordering a 3D colour patterned shell—from Shapeways 3D Print Bureau. There was an error in exporting the file to Shapeways, and they could not help or explain the reasons for being unable to upload the file. The patterned image references the use of the words ‘Imperceptible Realities’, and the effects the digital has on our innate vision of the world.

Shell

In the gallery, the physical 3D shell print was placed on a plinth (Figure: 100) to encourage the subconscious haptic rolling of it through the viewer’s hands in front of its digital, textureless screen renderings. My emerging computer skills did not fully comprehend the bounding box size on the computer screen compared to the actual size of the 3D printed shell; instead of being life-size, the shell returned from the Shapeways 3D Print Bureau six-times larger than expected. It felt like a shell because the 3D printed plastic left an almost chalky sensation on one’s hands—the 3D printed shell was heavy, and one may have held the shell instinctively to one’s ear.

Figure 100: Robinson (2015j), Conus marmoreus Shell, 3D print, 16 x 9 x 10 cm. Photographer: Ian Yendell.
Tinne’s work *Orbit (for Both Hands)* (2011), (Figure: 101) successfully contextualises the notion of the subtle relationship between the real object and its reproduction. This work is designed for the viewer to hold real shells with their left hand while simultaneously holding the 3D plaster shell prints with their right hand. Tinne (2011) implies two things through this work. Firstly, *Orbit (for Both Hands)* (2011), highlights the lost aura of the original, through the sensation of touch differentiation between the master (original shell) and the haptic loss of the “acoustic capacity of the original” (p. 30). Secondly, Tinne is curiously contradictory to Parrott’s (2012) notion of scanning as drawing. Tinne (2011) infers the relationship between a digital scanner, which *sees* but does not scrutinise the subject.

Like the shells in *Orbit (for Both Hands)* (Tinne, 2011), my 3D shell is solid; it could never be *real* because the function to hold the original creature is lost; the inside space is replaced by solid plastic. So in this instance, the surface of the *Conus marmoreus* shell 3D print is a surface illusion of the original. This returns us to the concept of simulacra and Baudrillard’s (1964) idea that for a long time, the world has been an illusion in the sense that nothing relates too nor is directly connected with real physical things.
The impact of the digital on my practice had temporarily disengaged me from understanding the importance of my lived world. The digitally printed 3D shell was unlike the real world calcified shell suspended in one corner of the work *The Confoundedness of Being in a Fractal World* (Robinson, 2015i), (Figure: 102). The real shell has had its patina removed because the sea has eroded it. The positioning of the real shell in the work was designed to question its origin, I wondered whether it would at first glance, be apparent that this shell specimen was actually real and not a 3D print (Figure: 102). From one viewpoint of the work, *The Confoundedness of Being in a Fractal World* (Robinson, 2015i) the suspended shell appears to float inside the perspex cube, this real shell is indistinguishable in visual qualities from the 3D printed *Conus marmoreus*, which while uniform and visually smoothed from a distance, on closer inspection reveals the difference between itself (the copy) and the real shell. The difference between the real and the copy can be seen when moving around the work in the gallery space.

Figure 102: Robinson (2015i), Detail: *The Confoundedness of Being in a Fractal World*, suspended real calcified shell. Photographer: Ian Yendell.
The carboniferous rock specimen hangs in a space between viewing the real and the digital. A midden of wax copy crangonyctoids; are cast in beeswax in the same wax used in taper form to smoke traditionally prepared etching plates—forming piles of repetition, cast offs, copies. Crangonyctoid 3D printed copies are suspended in limbo between extinction and neolife as translucent forms through which different visions lie. The crangonyctoid 3D prints still retained the digital spikes of hair-like threads that come off in your hand. The beeswax copies were cast from these 3D crangonyctoid prints in a process that reminded me of childhood memories of pink dental wax, forming rhizomic connections, always.
Summary

The 3D potato print was the starting point of this research project, the 3D plastic is inert as opposed to the decaying original—perhaps the fact that the original will decay defines its realness. A Rotten potato, dried fungus, and toxic spores are all that remain of the original potato that was used for scanning with the high-tech robotic arm. This potato is real: it decays, it changes; the plastic potato is inert, safe and hard. The same ABS plastic used to make the potato copy is used for printing car parts in the Edith Cowan University Engineering Department. The copy of the potato is static and mechanical; it has no charm of original nuances of colour and surface, the materialism of the real. Providing assurance for the materiality in my creative practice lies in liberal arts and sciences academic, Iris van der Tuin (2011) whose research into feminist new materialism, states the following in examining the material turn;

[The material turn is a] leap into the future without adequate preparation in the present, through becoming, a movement of becoming-more and becoming-other, which involves the orientation to the creation of the new, to an unknown future, what is no longer recognizable in terms of the present. (p. 276)

The material turn became a device for me to explore all my rhizomes of thought that affected the work in progress. The creative outputs exhibited in Eyes Open (i): Drawing in the Dark (Robinson, 2014i) and in Imperceptible Realities (Robinson, 2015t) did not necessarily provide exclusive answers but were designed to offer some way of pulling back from the attraction of the mercury experienced in my childhood, which refers to the habit of always coming back to the same thing—by self-attraction—to offer a different way forward for traditional printmaking.
Conclusion

Digital Realities
Conclusion: Digital Realities

The realignment of the digital aesthetic through traditional printmaking is a proposition that encapsulates the essence of this research. The purpose of this research was embedded in questioning a digital aesthetic that is seemingly affecting our capacity to interact with the physical world because of contemporary visual culture’s bias towards seeing through pixels. There were numerous possibilities in considering what could be gained and what could be lost through the increased uptake of digital technologies in printmaking. Potentially, to question the digital aesthetic defined in this research was a vast undertaking and the research objective needed to be tamed. The effect of adopting a practice-led research methodology facilitated a probing for possible differences in observing the world through traditional and digital means of printmaking. Practice-led research became a strategic methodological framework for my creative practice.

I examined traditional and digital printmaking, to ask how might the notion of a digital aesthetic assist or restrict visualisation of the physical world. To develop critical insight into exploring a world that is rapidly becoming simultaneously real and virtual. Conducting a comparative study that compared non-toxic printmaking methods against traditional toxic methods of printmaking meant that visual contrasts became the driving force behind the production of a substantial body of contemporary artwork. The value of adopting practice-led methodology lay in its multi-method approach encompassing archival and fieldwork research, alongside partnership and collaborative practices adopted for this study. The list of digital technologies available with which to explore the research parameters seemed endless.

Data-visualising photogrammetry software was the most notable digital technology employed for this research. Its technological impact on re-imaging the real came from scanning and image capture processes in relation to digitally rendering the original. One
approach analysed visual impacts of projecting digital images onto ancient geological cave formations to scrutinise what may be lost through the increased uptake of digital technologies in viewing the physical world. For me, it was clear that in contemporary society, there is the possibility that all images are potentially manipulated in some way. Considering this proposition, I asked what would it be like to not know any other way—to live through a technological seeing of the world through a square digital lens.

During the research process, my objective in creative practice remained productive in achieving playfulness through applying cyclical double-loop processing and rhizomic conceptualisation. Encouraged by these cyclical moments of insightful decision making and critical reflection I observed, recorded, and aligned visual data to reveal the impact of digital realities as the primary method for discovery that could question digital disengagement with the material world—offsetting digital disengagement with the material world against embodied viewing within that world. These explorations not only developed creative outcomes but fostered dialogues about the impact of digital technologies through the Imperceptible Realities exhibition (Robinson, 2025t).

At the outset of this research I asked what effect might a practice-led research approach have on producing a body of contemporary artwork. I found that adopting a practice-led research methodology aligned favourably with the way I navigate my world. Observing very small things through creative practice questioned and drove my ontological and epistemological understanding of the world. The research asked through traditional and digital printed representations of objects such as: a potato, a Crangonyctoid amphipod and a shell, how perception might be changing with the onset of digital technologies. The case-study analysis of Rembrandt’s traditional etching The Shell States I and II by Rembrandt (1650b, 1650d), undertaken at the British Museum substantiated the significance of the
close scrutiny of real things over digital renderings because such scrutiny offered me the capacity to see Rembrandt’s embodied thinking that lay in my visual analysis of the prints. Returning to Frayling’s (1993) term of research for practice, this spoke to “where the thinking is, so to speak, embodied in the artefact [sic] . . . in the sense of visual iconic or imagistic communication” (p. 5). It was an approach by which I could identify aesthetic value in support of traditional printmaking, albeit inevitably now in a hybridised form significantly influenced by digital technology. I had found in Rembrandt’s etching, which has survived since 1650, just such an embodied aesthetic. The work retains visible detail of scratches, and beautiful velvet inked lines. I anticipated that my research outputs too could hold some kind of embodied communication—held in the artefacts for others to follow.

This led me to consider the experiential relationships to the world in contrast to digital representations of it. Merleau-Ponty’s (2002) notions regarding embodiment through the lived-body significantly informed my creative practice. I argue that the materiality of seeing benefits over the blind flat-texture and sameness in digital renderings alone. The digital is privileged over the eye, not only in the reproduction of images but within the very fabric of contemporary printmaking itself as found in the Rijksstudio (2012) freely available digital copy of The Shell, which denies the aura of the original Rembrandt etching.

I was able to consider the effective use of digital technologies by observing and interacting with the materiality of my immediate environment. I set out to test traditional values in observing the world with a naked eye against updated ways in which contemporary artists are testing digital 3D print technologies that question the imperceptible boundaries between the original and the copy. I suggested that the squircle was one way to describe the merging of the traditional lens into a digital lens that has been exploited in hybridised prints. This position recognised the benefits of digital technologies that enhance our relationship with the world, while in contrast, examining the hypothesis that over-reliance on digitally
viewing the world could prove to be problematic. I was intrigued to consider what cognitive impact becoming completely conditioned to seeing through computer-generated digital technologies may have on our perceptions of the physical world. Contemporary visual realities are changing: reality is not static—it is always changing. Contemporary artists Quinn (2012, 2013, 2015a, 2015b, 2015c) and Parrott’s (2012) contemporary 3D prints clearly investigate and introduce alternate meanings to our position in the world—a position that lies between the original and the copy, and the real and virtual. A strategy I chose for this research was to disrupt meaning through a process of utilising mistakes. I set out to disrupt the software designed to capture the real and to unsettle other technologies to create engaging artwork, and continually draw my practice to a point that asks something new. I intended to provide a direct experience for the viewer in the Imperceptible Realities exhibition, a perceptual experience that moved away from reactions to digital technologies to proceed with a dialogue between digital and traditional printmaking.

My creative practice utilised methods that innovatively linked visual perceptions of the real and the digital. It began by tracing the history of printmaking from traditional toxic etching techniques to techniques for contemporary digital printmaking. I used comparative studies. I was enthused by a potato, a crangonyctoid and a Conus marmoreus shell to compare non-toxic printmaking methods against traditional toxic methods of printmaking. To draw connections between aesthetic and technical differences between toxic and non-toxic etchings, the case study of Rembrandt’s (1650b, 1650d, 1650e) The Shell States I, II and III proved to be enlightening. This research called into question the ongoing relationship between the printed original and its copy, in light of the digital aesthetic. A dualistic relationship—between original and copy—that Camille suggests continues to “question the ability to distinguish between what is real and what is represented” (1996, p. 31). The developing ontology of Baudrillard (1994), Deleuze (1983), and Massumi (1987) paralleled
the rapid changes in the use of technology, providing a continuum from this rhetoric regarding the simulacra. To counteract what I construed as technological interference in our visualisation of the world, I chose to create work that enriched perceptions. Both traditional and digital approaches were expended in a calculated organisation of Perspex cubes designed to incite perceptual qualities for the observer. This was revealed in the work *The Confoundedness of Being in a Fractal World* (Robinson, 2015i) (Figure: 82, p.180). The studio existed in *spaces* between collaborative practices and in *unusual places* (the cave). These spaces had the potential to dislodge further the relationship between digital and traditional printmaking.

This research has explored the value in the close scrutiny of things. I found that the impact of the digital on my practice temporarily disengaged me from understanding the importance of my lived world. A process of discovery through immersion in the cave studio opened up new caverns for research. Immersion starts from the unknown, immersion opened up new theoretical possibilities for my creative practice by the very essence of the cave experience not being planned—other than choosing to enter the cave. Above all else the immersive experience aligned with theory and opened up a conceptual cavern for creative practice. Immersion reinforced the concept of spending more time *seeing* as a powerful philosophic tool for conceptualising an interpretation of my surroundings. While this may sound simplistic, my embodied *perception* was exposed to ground my sense of place, which in turn brought value to implementing perception as a tool for examining physical objects in the world through creative practice. The excitement in the greater possibilities of understanding physical matter through engaging the notion of greater watching was employed alongside theoretical debates surrounding simulacra.

In the rendering of a humble potato, a crangonyctoid and a shell lay a turning away from the material real. The original image of these objects became digitalised and my visual attention
was coerced into viewing digital information on screen. My focus was tuned into the editing of digital information held in photogrammetry software 3D meshes derived from the original potato, the crangonyctoid model and the *Conus marmoreus* shell copy that were confined forever within numerical data. It was becoming clearer through creative practice that the pixel was highly divisive through its orientation in photogrammetry apps that linked the Cartesian grid closely to reproducing the original.

The first exhibition that resulted from this research, examined my reaction to my immersion in the cave: Eyes Open (i): Drawing in The Dark (Robinson, 2014i) was designed to explore the differences between observing digital images and natural forms. The myriad of answers seemingly lay in the way visual information derived from the original was digitally translated by technologies and presented. The digital projections appeared appealing; the viewer seemed to be *seeing technology* not the image—the seduction of the digital aesthetic seemed to degrade real things. This experience was fascinating for me as an artist who habitually thinks through traditional printmaking and drawing. This digital seduction was observed in those visitors to the cave exhibition, Eyes Open (i): Drawing in The Dark (Robinson, 2014i), who asked if they could photograph *me* on *their* iPhone while I was drawing in the cave. This observation suggested that people are more interested in the allure of the digital than paying attention to the physical cave environment surrounding them. For me, entering the limestone cave metaphorically encapsulated a potentially detached space in comparison to the concept of an outside world seemingly inundated by digital technologies. Metaphorically it was only through digital images that were brought *into* the cave, either projected or viewed on an iPhone, that the cave geologies and the outside world met.

I again experienced this seduction of the digital aesthetic degrading real things, with my purposeful use of the digital wall for the Imperceptible Realities exhibition. The visitors seemed impressed by the high-resolution digital wall *itself* rather than the content or
experience of looking at the short film playing while avoiding the embodied haptic and visual experience encouraged by placing the 3D shell print at an amiable viewing distance from the screen. A conditioning of the viewer to a heavy reliance on digital and ultimately geometric interpretations of the world that are indicative of the digital and intentionally implemented in the creative outcomes in fleeting examples throughout the Imperceptible Realities exhibition (Robinson, 2015t).

I drew conclusions from the research process, which clarified a greater understanding of the importance of an embodied relationship within the world. Phenomenology endorsed the materiality of seeing by reconnecting me with the importance of being in the world. Embodiment enhanced production in my creative practice that could not be revealed in any other way—it revealed open thinking that aligned with what digital technologies could offer us in a different way for understanding physical aspects of the world. Aligning observations to the physical world resulted in partnerships and collaborative explorations, which were approached through an innovative playful irreverence for photogrammetry software. This alignment produced hybridised prints that risked something going wrong. This approach to aligning observation to the physical world developed exciting dimensions in digital image making in spaces between collaborative practices and in unusual places (the cave). The purposely-unsettling space was designed to test which modus operandi preferences human vision.

Spaces with the potential to dislodge further the unstable relationship between digital and traditional printmaking were explored through this PhD research project. These spaces were enhanced and the digital aesthetic was enticed to work in tandem with the original object in creating new images. The research objective was fulfilled by irreverence in approaches to securing innovative work for the exhibition Imperceptible Realities (Robinson, 2015t). Overall significance lies in the contribution of this research to the ongoing histories of
printmaking, which are continually developing as digital technology expands with the ability to continually change, refine and innovate. Through its very nature, this practice-led research project generated directions for future research, which are described below.

Future Research

This practice-led research built a platform metaphorically neither above nor below ground for new Deleuze and Guattarian (1998) lines of flight to emerge. Where crossed lines emerged which are neither wholly circular nor square, but come from within the squircle. Meshy crossings created potential for new work. Future research will:

- continue to invert technologies such as Simpleware, which are designed for visualising the real by reconstructing slices of digital images uploaded to make 3D models in the program by starting with slices of drawings to upload into 3D models
- integrate newer 3D printing in colour and patterns into printmaking practice, which I was unable to achieve in the scope of this research
- investigate Xanthorrhoea preissii resin for making etching ink. There is potential to undertake further research on the use of Xanthorrhoea preissii resin in arts practice, and to employ future tests on procuring etching ink from the resin pigment that was not realised through the PhD candidature
continue to follow the case study of Rembrandt’s *The Shell* prints, academic Sean Cubitt’s (2014) extensive research into digital aesthetics and *The practice of light: A genealogy of visual technologies from prints to pixels* offers intriguing evidence for the origin of pixels in nineteenth-century prints. Cubitt (2014) describes “Rembrandt’s attempts to achieve pure black by tricking the viewer and the rise of geometry as a governing principle in visual technology, seen in Dürer, Hogarth, and Disney, among others. He finds the origins of central features of digital imaging in nineteenth-century printmaking”

The digital 3D print of the *Conus marmoreus Shell* (Robinson, 2015j) has never seen the sea. It will be returned to the sea encoded with a digital message to return it to land and me if anybody happens to find it. There is always cause to ‘print it anyway’ too see what may happen. Traditional printmaking processes for me become invigorated as unpredictable views acknowledged through my practice are electric in comparison to a discursive construction of realities relationship over the materiality of seeing. My research was designed to distance itself from the habitual process of always coming back to the same—to pull against the self-attraction of the mercury from my childhood memories and to offer a significant and different way forward for traditional printmaking that encompasses innate vision as material practice, an act of seeing, where the object of attention and cognition can be *altered* through *seeing*.
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