Plasmatic: Improvising Animated Metamorphosis

A project submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

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Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the project is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Andrew Buchanan

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PLASMATIC

IMPROVISING ANIMATED METAMORPHOSIS

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A dissertation submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy, Creative Media

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ABSTRACT

This practice based research dissertation presents a new approach to improvisation in animation using digital sculpture. The artworks submitted are supported in this document by both a comprehensive description of the processes and practice approaches used in their creation, as well as a theoretical grounding that links improvisation, digital sculpture, and animated metamorphosis through psychology, practice, cognitive science and philosophy.

Including both software tools and virtual materials in an embodied model of cognition, this research describes a new workflow based on an improvisational material interaction with virtual 3D mesh through digital sculpting software.

The natural product of this iterative, improvisational process is metamorphic animation, able to convey the substantive and transitive aspects of cognition in animated form. This dissertation supports a series of works titled Plasmatic (No. 1, No. 2 and No. 3) that were produced and exhibited in 2014 and 2015, as well as a range of experiments that show the development of the workflow and unique approach to the creation of the final works.

Existing theories of metamorphosis in animation focus on the cultural, political and ontological freedom offered by unconstrained graphical forms. This research expands these theories of metamorphosis by showing that animated metamorphosis can also depict functional correlations between image and thought processes. This approach is not focussed on analysis of the contents of thought, or on the contents of the animated morphing images, but rather connects the medium specific aesthetic of the metamorphic image and the processes of its creation with the temporally extended processes of thought progression. Animated metamorphosis allows for a visual depiction of the transformation from one thought to the next.

The Plasmatic series submitted supports an argument that metamorphic animation can be used as a heterophenomenological vehicle for conveying the nature of a spontaneous thought impulse and stream of consciousness to an audience. In this way, this practice based research presents the process of animation as an investigation into phenomenal consciousness, and the animated metamorphic image as a unique philosophical instrument.
KEYWORDS

Animation, plasmatic, metamorphosis, improvisation, 3D animation, CGI, experimental animation, embodied cognition, digital sculpture, stream of consciousness, creative technology, unconscious, psychic automatism, digital craft.
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1. INTRODUCTION

“The easy bit is making works of art. The difficult bit is to make works of art in the way in which everyone should ideally do everything: opening open up our minds as we go to the astonishment of discovering new possibilities for regular action that we did not know were available to us until somebody or something unexpectedly showed us how.”

(Brook, 2012)
This dissertation is submitted as a contextualising and explanatory accompaniment to the Plasmatic series of animated projection artworks, Plasmatic No.1, Plasmatic No.2 and Plasmatic No.3. These three animated works offer a new form of semi-straight ahead animation, and a new approach to digital 3D animation production. These three works emerge from experimentation with digital materiality.

Figure 1. Images from Plasmatic No. 1, Plasmatic No. 2 and Plasmatic No. 3, experiments with digital material.

In the Plasmatic works, there is a focus on form and metamorphosis, excluding many visual potentials of animation such as colour, line, interaction between objects, pattern, texture. The artworks were created and exhibited during 2014 and 2015. Based on a series of experiments in 2D animation, illustration, digital sculpture and 3D animation, these artworks display a new application of digital sculpture to straight ahead animation. The resulting metamorphosis emerges naturally from the improvisational approach.

Together, this written dissertation and the video documentation of those artworks present this practice based research project in animation and creative media as a contribution to a lineage of visual improvisation practices. This document explains the background, methods and processes involved in conducting the research and the production of the creative works submitted.

Discussion and analysis of these visual results is offered in the context of theories from a range of disciplines including philosophy, psychology, art history and perception, detailing an intentionally broad and transdisciplinary contribution to understandings of improvisational visual practice and metamorphic imagery in animation studies.

This introductory section outlines the research aims and rationale, provides an overview of the sections in the dissertation and offers a summary of the creative works submitted for examination, including details and conditions of exhibitions held to date.
1.1 RESEARCH MOTIVATION, AIMS AND VALUE

This section outlines the inciting motivations, aims and contributions of the research project, describing the objectives and strategies of this work in achieving new knowledge for animation practitioners in the form of new animation techniques, new theoretical contributions to the animation studies field and the offerings of new visual experiences to audiences.

RESEARCH MOTIVATION AND RATIONALE

This research is motivated by a recognition of opportunities in digital animation tools to develop new forms of joyful, expressive, process based practice in animation. In developing these new experimental animation processes, there is an instinct that these emerging processes can lead to the creation of new visual outcomes on the form of a new type of animated metamorphosis, one that operates as a perceptual as well as a philosophical instrument.

Motivating this research is a compulsion to create visual forms and animated images that are expressive of interior images and instincts, where this behaviour is spontaneous, unplanned and where this act of creation facilitates personal states of excited exploratory engagement with the tools and materials involved. This is partly in reaction to a vague sense of external pressure that one should not normally behave in this way – that it is irrational. But ideally, this activity seems in fact to be exactly how one should behave, given the opportunity.

JOY

There is an expressive liberation available to artists that approach their work with instincts, skills, materials and intentions, but without plans. This is an open orientation to possibility. They may bring to their work their personal states of being and their emotions and they may enter into relational activities with the materials of their practice, motivated by exploration and propelled by the experience of making, more than by anticipation of the results of their labours. Art practice of this sort if often referred to as ‘process focussed’. Much like the process metaphysics of Alfred North Whitehead (among others), this approach is focussed on the notion of becoming rather than on being (Seibt, 2016). As with the philosophical branch, a focus on process in the creative arts questions the primacy of the artefact and the outcome. This necessarily personalises the activity and value of art practice as it shifts (some of) the emphasis from the witnessing of an objective artefact, to the subjective experience of those involved in the ‘becoming’ phases, and in doing so, often inclusively draws the audience into the becoming phase, or meaning construction of the artwork.
Art movements including early surrealism focussed on developing approaches to art making that were concerned primarily with a rigor of practice (along with the practices of life) rather than with the visual (or other) artefacts produced. In the first manifesto of surrealism, Andre Breton advocates for activities that can:

“express — verbally, by means of the written word, or in any other manner — the actual functioning of thought. Dictated by the thought, in the absence of any control exercised by reason, exempt from any aesthetic or moral concern.”
(Breton, 1974)

This early surrealist focus on process purity, while slightly obsessive, was an early inspiration for this research project, inspiring a sense of curiosity in forms of animation process that take this approach, the possibilities and limits imposed by temporality and technology, and what types of experiences, artefacts and insights such efforts might produce.

Another inspiring process focussed artist is Frederick Franck, who equates the process of drawing a landscape with meditation, indifferent to the visual results;

“Once a drawing is finished, it should be forgotten. After all, it is only a fossil of experience. A fossil however that at any time can be resurrected by any eye that is sufficiently awake to follow the lines as process, to sense that A DRAWING IS NOT A THING, BUT AN ACT [emphasis in original].” (Franck, 1973)

It is not so much the case that this process focussed approach is lacking entirely in digital animation production, merely that it is not necessarily the purpose for which contemporary (commercial) digital tools are developed, and as such there is scope for - and need for - enquiry into what is possible in terms of continuing these practices in new mediums. Digital tools are also developing at a previously unseen rate – even within the span of this research project.

Ultimately, the motivation towards process based creative work is based in the joy and pleasure involved in this type of work. Process based work is meditative, free of external pressures and liberating.

DIGITAL INTUITION

Animators using digital image making tools and software are faced with an incredible and growing array of opportunities for visual innovation. For those that train to use them, tools used to produce 3D animation (a colloquial term referring to the virtual three-dimensional build space in
computer graphics applications) can create simulations of real and fantasy places, characters and events at an ever increasing speed and quality. Alan Kay, instrumental member of the team that developed the world’s first personal computer, strove to create a “fantasy amplifier [...] a dynamic medium for creative thought” (Kay, cited in Rheingold, 2000). But, at least initially, these digital systems offer their visual rewards in exchange for the sustained efforts required on the part of the artist or animator to achieve proficiency with these tools and to understand and conform to the expected workflows, patterns and sequences of operation which together comprise the software. In the case of most 3D animation platforms, an expected visual result is achieved by accurately completing a series of tasks in their correct manner and sequence in order to construct, treat, assemble and move the components that comprise the final images, and the degree to which an artist can control the process is sometimes said to rely not only on their artistic knowledge and skill, but on their ability to engage with the expected languages of the software;

“even today, with all the advances in software, the degree of programming and systems expertise is critical to having more artistic control over the developing process.” (Edmonds, 2004)

This separation and sequencing of tasks is not unlike many post-industrial revolution manufacturing and production paradigms. Tasks are modularised and made discrete, because by doing so, predictable outcomes can be designed, refined and produced most efficiently. Charles Jenks (2013) cites John Kenneth Galbraith who states that any advanced technology is accompanied by specialisation and systematic application of systematised knowledge. This drives standardisation. This expedience of production may be referred to as ‘technical rationalism’.

The rewards of this technical rationalism are fairly clear. This approach underpins the modern technological reliability that brings a thousand seen and presumed benefits. In the creative domains, these rational structures offer huge benefits of processing power, storage, connectivity, convenience, visual accuracy and efficiency on which entire new visual cultures are built. When compared to mechanical precedents, especially in the field of animation, digital systems could be said to create a much closer connection to artistic expression (Van Der Plas, 1988).

There are however, some approaches to art practice, and in the case of this research, to image making and animation practice that must question this systematisation and the application of a technical rationalism that terminates some art and craft traditions in favour of the expedient need to conform to the anticipated and designed workflows within a digital tool. I am motivated by an instinct to negotiate a representation of something other than the visually appreciable external
world, and as such, there is often no simple means-to-end rational structure that can conform to expected software workflows.

This research is motivated by an anticipation that digital animation tools need not preclude an expressive, intuitive and improvisational orientation to the practice of art and animation, even where they appear – as in 3D animation technology – to impose strict technical rationalist requirements. There is an opportunity for a humble revolution that captures the abundant benefits of digital production technologies; a gentle revolt that can continue evolved art and craft practices and an opening of potentials not just by replicating them, but by extending these practices into and through new technologies. Unlike Jenks, who claims of the technical rationalist model that “this force is absurd, if not actively destructive” (2013), this research proceeds from a presumption that the existence of a technical rationalist background need not define, nor limit the utility of new technologies. And unlike Edmonds, who above advocates a greater access in software to deeper levels of digital structure and code, the work presented in this research project happily devours available processing power and embraces the artifice of the digital interface as a means of conveniently accessing new ways of making improvised animated images.

It is in fact the digital tools, including both hardware and software, that may provide the means by which to bypass the technical rationalist model. In this research, the digital tools used are re-purposed, but in fact their very existence – the opportunity to repurpose them – arises because to some extent the design of contemporary tools implicitly acknowledges the importance of crafting practices. For example, the creative practice pursued in this research project uses a stylus based digital drawing tablet that emulates drawing on natural, analog media, and digital sculpture software that treats virtual digital materials more like clay to be moulded than like a set of building materials to be measured and constructed. It is, in part, new opportunities offered by, and catered for by these tools that motivates this inquiry into new forms of practice possible in digital animation.

EXPERIMENTATION

The history of experimental animation is one that follows this narrative of investigation of the possibilities of re-purposing and adapting technologies to serve an artistic instinct. The lineage of direct film animation, created by painting or scratching directly on film, the physical manipulation of materials under a camera and the admixture through photographic technology (and other technologies) of different formats of image and sound should not pause with the advent of the
digital, it should accelerate. The array of electronic art, animation, abstraction and contemporary experimental digital animation demonstrates this.

Donald Brook identifies differentiates between two key types of experiment; those where the process is directed towards proving or disproving a hypothesis – the establishment of some truth or validity of a claim (more common to science), and those where the results are unpredictable, or at least, unpredicted “ (Brook, 2012). The latter is the mode of this research. In fact, Brook claims that to describe art practice as experimental is a tautology, and that “In the sense of “experiment” in which the result of one’s activity is not anticipated, art cannot but be experimental” (Brook, 2012). There is a subset of approach to the creation of animated images that is referred to as ‘experimental’ that separates (broadly) the work of standard narrative based and production-line procedures of the commercial animation studio (Russett & Starr, 1988) from an aesthetic, non-objective and non-narrative from of practice that preferences the use of colour, shape, texture, mood and materiality to convey emotion, personal experience and subjective expression (Wells, 2013). Under these terms, this research is motivated by the very process of experimentation as a means and an intrinsic (if not universal) mode of animation production. The experiments are not undertaken to test a hypothesis but to explore the potentials of particular approaches to improvised digital animation. Experimentation then is both a motivation and a part of the methodology in this research.

When digital tools become collaborators in a material expression, the locus of control over the final image outcomes is always somewhat contestable, with electronic digital and generative tools often blurring the lines between tool, material and collaborator. This is often what makes experimental work of this kind compelling and interesting. In this research, I am motivated by a sense that the digital should serve. Not in the sense of catering to an intended image result, but rather I am motivated to uncover types of practice that capitalise on the efficiency potentials of the digital tools and materials, while maintaining a focus on representing instinctual and expressive personal content.

ONGOING MOTIVATIONS AND CONTEXT

Some of the motivations outlined above existed before the research commenced while others developed and deepened through the research process. Similarly, there is a constellation of peripheral areas of interest and inquiry that have preceded and paralleled the research process, some of which have become part of this dissertation and some that have been relegated to the background. Some of these have manifested as ancillary research
outputs, documented in the appendix section of this dissertation, while some will form the basis of future research projects, both written and visual.

Such relevant areas of research and activity that may be of interest to the reader include a professional and academic background in 3D animation production and industrial design, a keen interest in 20th century art, particularly surrealism and abstract expressionism, an engagement in the philosophical branch of consciousness studies and philosophy of mind (as well as neuroscience and perception science), and a personal history of making, tinkering and customising.

Personally, I have often been consumed by wanderlust, political idealism and anarchistic tendencies, an overly romantic nature and large appetites. This list may provide a sense of personal perspective from which I approach this (occasionally personal) research project, though there is effort within this document to constrain the overly subjective to appropriate sections.

RESEARCH AIMS

The aim of this research is to investigate the potential of animation, and in particular, digital sculpture and metamorphic 3D animation, as a medium for improvised image making. This dissertation, and the accompanying documentation of experiments and exhibitions presents new visual work capturing and conveying spontaneous visual thought and visualisations of the internal stream of consciousness using contemporary animation technology and in this way, aims to document a new type of metamorphic animated image, one that intrinsically arises from the experimental approach of its production. This research is not focussed on explaining the contents of these visual improvisations, but rather on the use of the intrinsic properties of the animated metamorphic image as a vehicle for delivering a visual experience of the process and nature of those internal experiences.

Extending the history and tradition of artistic attempts to capture the internal and subjective, this research aims to demonstrate that animation has unique properties that allow it to represent aspects of mind and temporally extended internal thought processes unavailable to other media. Specifically, I establish that metamorphic animation can analogically visualise the process by which one thought transforms into another within the personalised stream of consciousness. This positions metamorphosis, or plasmaticity as a unique property of animation that emulates a specific property of mind. This finding creates a relationship between processes of mind, improvisational art practice and animated metamorphosis.
This attempt to present spontaneous internal imagery calls for production processes that involve visual and material improvisation, able to be recorded over time. Current animation software presents both opportunities and constraints in this research. Software employed in this research and creative processes is generally not designed with improvisation, unstructured production or open ended experimentation in mind. This research establishes a new orientation to software selection and use that discards some established technical image production logic in favour of an approach informed by craft traditions. In achieving this, this research demonstrates potentials that arise from software mis-use and re-purpose and illuminate a restrictive culture that is reinforced by toolset design. Building on this new orientation to the software involved, a new practice of animated digital sculpture is documented.

RESEARCH AUDIENCE AND ANTICIPATED VALUE

The anticipated audience for this research is animation practitioners involved in individual and experimental practice using digital tools, as well as scholars from the animation studies discipline. Additionally, there is anticipated value for audiences of the creative works through the offering of a new art experience.

This research extends the established boundaries of animation production, a practice already inclined towards the bizarre, the non-veridical, the metaphorical and towards visual manifestations of inner experience, by documenting new opportunities and technologies for visual improvisation, and new visual results of this practice.

Animation practitioners may find the new approaches to established digital sculpture and animation production established by this research relevant to their creative work. This research highlights issues for the practitioner regarding not only the technical and practical aspects of digital sculpture and animation production, but additionally, issues regarding their orientations to, and personalised ‘states’ of practice when producing animated images and dealing with virtual materials.

I present the metamorphic image as a unique artefact in relation to improvisational practice. Through the development of animation methods which utilise intuition and the expression of emergent mental imagery, this research presents a new form of theoretically grounded practice for the production and reception of particular types of metamorphic animated images. By formalising a methodology for intuitive and automatic practice in animation, this work contributes to the theoretical and practitioner focussed understanding of cognitive models of creativity in animation production. These findings are presented both in this dissertation and as visual
experiences in the visual works exhibited (and the submitted documentation of those exhibitions).

This practice-based research draws on an established practice of improvisation in the visual arts including the surrealist practice of psychic automatism, and conducts this practice using a contemporary digital toolset. Whether adopted wholly by any other animators, the tools and workflows presented promote optimisations or innovations in improvisational workflows for other artists interested in similar work practices. Psychic automatism and related automatic practices have been highly influential in other media (primarily in the fields of writing, drawing and painting) and the expansion of the set of known and tested approaches for this common practice is of benefit to practitioners and scholars in these areas.

Animation scholars may anticipate a contribution through the development theories relating to the metamorphic image in animation. Metamorphosis in animation has primarily been considered as a perceptual phenomenon in animation and image studies, but one that has deep, and well explored political and cultural implications. This research will add to these dimensions of understanding of the metamorphic image by considering the production of animated metamorphosis – particularly through improvisation – as a unique image making practice that links mind and image.

This research presents a series of animated metamorphic artworks as a new visual experience for audiences that are perceptually confounding, hypnotic and engaging. The creative works presented do not dictate meaning, nor lend themselves to complicated interpretation of their content. They are intended to present a new type of image, a new type of motion and a new type of animation that engages through its inherent properties, motion and perceptual effects rather than its content. The works become sites, or vehicles of ‘integral experience’, in the terminology of John Dewey (2005), intended to expose the audience not to specific content, but to the function and behaviour of animated metamorphosis.
Simon O’sullivan has identified art of this purposefully vehicular kind as having an “immanent aesthetic as function” (2001), contrasting it with art that can be considered as a ‘cultural’ object. A new form of animated image is presented. A new perceptual experience of metamorphosis. In building on this particular form of functional aesthetic my research intends to overlook immediate conscious cognition in the reception of the work, providing instead an opportunity for audiences to appreciate the medium-specific attributes of metamorphic animation.

As artefacts, the exhibited works encapsulate the findings of this research by presenting a tangible experience of the link between improvised animation, animated metamorphosis and internal mental experience.

1.2 OVERVIEW

This overview presents a summary of the contents of each of the sections in the written dissertation.

2. BACKGROUND

The background section of this document traces a brief history of inquiry into the nature and structure of internal thought experience. Starting with William James and the description of the stream of consciousness, the background establishes a historical trajectory of attempts to classify and describe the nature of these internal thoughts.
Following William James, developments in art history that have attempted to visualise the nature of internal experience are discussed, with an emphasis on surrealist psychic automatism. Applied to writing, drawing and painting, this multi-modal practice claimed to be a way of expressing the internal functioning of thought. As a practice contemporary with Freud’s topological view of mental structure, this is a brief history of relevant art-making that sought to express the unconscious through receptive improvisation.

Post surrealist views on the nature of cognition and the status of the unconscious beyond Freudian psychoanalytic repression seem to undermine the practice of psychic automatism as such. These updated understandings of mind can provide new understandings of this practice.

These updated views on the nature of thought are explored briefly in the background section as they pertain to the development of artistic practices that seek to create visual record of internal experience and extend practices based on receptive states of improvisation.

Examples of analogous practices in experimental animation have explored the ability of animation in its various mediums and incarnations to both express aspects of internal experience and to provide material sites of experimentation and abstraction. This section includes a brief overview of these efforts in animation history and a focus on direct attempts to achieve similar practices by artists such as Len Lye and Norman McLaren, concluding with a brief discussion on the incorporation of animation technology in intuitive experimental animation practice.

3. METHODOLOGY

This research is conducted as practice based research using the model of the iterative cyclic web. As noted, animation studies is an inherently inter-disciplinary field. The iterative cyclic web provides a model for research that facilitates and formalises a range of research activities including practice that is led by research, research that is led by practice and more traditional academic research. This model helps to integrate the various outputs from these different activities.

The methodology section of this document explains the iterative cyclic web in more detail and maps its application to this research. Additionally, this section provides a brief overview of practice based research and the necessitating features of this research that calls for a practical response to the research questions.

In the methodology section, I argue for a phenomenological view of the created artworks. This acknowledges the inherently subjective nature of a first person internal inquiry – a subjectivity
that often puts the creative arts at odds with empiricism when claiming artworks as knowledge transferring instruments.

As a solution, this section of the dissertation introduces Daniel Dennett’s term ‘heterophenomenology’, a branch of phenomenology most often applied in research in the discipline of consciousness studies. Literally meaning ‘the phenomenology of another’, heterophenomenology is simply a model for the use of a subjective record of internal experience as a reliable instrument for the conveyance of that experience to a third party. In the case of this research, it is this model that establishes the submitted creative works as capable of representing the conditions of their production.

Additionally, the methodology section describes the epistemological position of the creative works as knowledge transferring research results by identifying that the knowledge captured and transferred is tacit knowledge, some of which is accessed through reflection and written documentation and some of which is ineffable and is transferred to audiences through the exhibition activities (and documentation of these).

4. PLASMATIC – IMPROVISING DIGITAL SCULPTURE

This section of the dissertation describes in detail the process of making the digital sculptures for the creative works submitted. This begins with setting up a suitable digital object, workspace and personal orientation to the process of improvising with digital sculpture. The object that initiates the sculpture process requires specific technical attributes – an even mesh arrangement and a high number of polygons. The technical, practical and theoretical issues involved are described.

A theoretical and definitive analysis of improvisation is provided to explore the way in which findings from musicology, dramaturgy and other performative practices can and have been adapted to practices of visual improvisation and animation.

The move from a technical rationalist orientation to producing three dimensional digital objects to one that is more craft-oriented requires practitioners to interrogate their relationships with both the technological tools and materials of their practice. A brief review of the work of Martin Heidegger regarding technology as well as art, provides grounding for this consideration of a relationship to technology and the risks of seeing the world through outcome focussed technological paradigms.

These reflections on technology are continued by considering Merleau-Ponty’s notion of the virtual body – the phenomenological integration of technologies and tools into our natural
interactions. Both Merleau-Ponty and Don Ihde see certain of these technologies as having ‘embodiment relations’.

Improvisation is presented as a necessarily embodied and situated experience, adopting an extended mind view from Malafouris that includes the tools and materials of production as necessary component parts in the cognitive act of improvising. In the case of this research, these tools and materials are digital. The work of Malcom MacCollough on digital and abstract crafting is also central to the reflections on the practices and processes involved in interacting with the digital materials. Ultimately, the practice of improvising digital sculpture for this work is requires reconsideration of mental state in combination with a re-orientation to digital tools that incorporates them as collaborators in an embodiment relation of intuitive actions.

The sculptures are reviewed briefly and although the formal and figural content is not directly relevant to this study, both the process of their creation and the visual outcomes are briefly compared with the work of other animators for comparison.

5. PLASMATIC – ANIMATING METAMORPHOSIS

With the previous section having dealt with the sculpture phase of the creative practice, this section describes how these sculptures are then combined for animation in a manner that best preserves the nature of their production. When the sculptures are arranged on an animation timeline, the connection between improvisational sculpture process and animated metamorphosis is made apparent.

Metamorphosis, as a defining property and medium specific attribute of animation is discussed both historically and theoretically. Historically, the metamorphic Fantasmagorie (Cohl, 1908) links the visual fluidity of metamorphic progressions with the concept of the stream of consciousness.

Within the field of animation studies, metamorphic animation has a special place both as a differentiating and defining property of the medium, but also as a theoretical metaphor through which numerous analyses of modernism, industrialisation, freedom and human (as well as post-human) nature are explored. The visual results created are considered in the context of these theories of metamorphosis and plasmatic animation materials.

Animated metamorphosis presents a unique perceptual experience. In addition to the historical, theoretical and political relevance of animated metamorphosis, this section provides a speculative position that animated metamorphosis has a special neuro-perceptual status as it presents sensory visual input that interrupts the normal visual process of attending from stable visual
features to stable mental schemata in the form of object concepts. Further, animated metamorphosis may trigger neurological functions that register difference between expectations and perceptions. These suggestions are based initially on the work of prominent neuroscientist Semir Zeki, who has commented extensively on the neurology of art perception (see also Appendix 2, section 9.2, Dali, Disney, Destino; Speculations on Metamorphosis and Multistability).

Ultimately, from a theoretical perspective, and linking these theories with practice, this section explains the culminating position of this dissertation – that metamorphosis, and the plasmaticity of animated materials resonates as practice and as image because it shares properties of mind. The avoidance of fixed form and the fluidity to move between concepts is supported by the initial work of William James (on the stream of consciousness) as well as animation theorists including Eisenstein (on plasmaticness), Klein (on the animorph and its relation to James’ flights and perchings of the mind) and Lepot (on the plasticity of mind). In this research this mental plasmaticity relates not just to the perception of animated metamorphosis, but is integrated into the practices and orientations to the process of animation, and to the nature of digital objects.

6. CONCLUSION AND FUTURE WORK

Recalling initially the research aims outlined in the introduction, this concluding discussion summarises and integrates the reflections on the creative works submitted and the other research activities.

What is ultimately discovered and recorded in this research is an integrated practice of improvised digital sculpture and animation that leads to a visual result of animated metamorphosis. As the tools of production are integrated into an expanded embodiment relation with the practitioner, metamorphosis emerges naturally as an attribute of mind functioning that animation is able to capture and translate into visual form. The theoretical implications of this for animation studies are summarised and future work that arises from the findings is described.

1.3 SUMMARY OF CREATIVE WORKS SUBMITTED FOR EXAMINATION

This section describes and catalogues the creative works submitted for examination. The primary creative contribution is a series of three projection artworks titled Plasmatic No.1 – No.3. These works were produced and exhibited during 2014 and 2015, with some minor exhibitions ongoing. The works have been exhibited both separately, and as a collection. Descriptions of the exhibition of these works is documented here as a register of the dissemination of research findings and
connection with broader fields of practice and research in the disciplines of animation, animation studies, and electronic art in theory and practice, and connection with audiences.

The works themselves can be classified as video art or animation installation, in that they are of fixed running time, but arranged to seamlessly loop to allow extended display. All exhibition instances have required this for installation (rather than the works being shown as part of a sequenced program of screened works). The works have been presented in public space.

The primary exhibited works submitted are supplemented by a number of video and image files containing the results of experiments conducted for this research. These experiments were not intended for exhibition, but show the development of the eventual workflow and in some cases, display the research findings equally as well as the final series of works, if without the dissemination value. Thorough explanation of these experiments and preliminary works can be found in Appendix 1 (section 9.1).

In addition to exhibition to the general public, the works described in this section have been used as the basis for presentations given at academic conferences and events focused on experimental art forms. Abstracts from conference presentations where portions of the creative works were shown, described and discussed can be found in Appendix 2 (section 9.2) of this document.
DISSEMINATION THROUGH EXHIBITION

Descriptions of the exhibition of these works is described here as a register of the dissemination of research findings and connection with broader fields of practice and research in the disciplines of animation, animation studies, and electronic art in theory and practice, and connection with audiences.

PLASMATIC NO.1 – THE GERTRUDE STREET PROJECTION FESTIVAL 2014

The first exhibition of Plasmatic No.1 was at the Gertrude Street Projection Festival in Melbourne, in July 2014, curated by Kym Ortenburg. This festival is an annual 10 day (night) light and projection art event and visited by up to 30,000 attendees (The Gertrude Association, n.d.). The event is centered around a street in inner city Melbourne, with the main exhibition spaces in shopfronts and public spaces.
The work was installed inside a commercial retail space on a busy street in inner Melbourne, projected onto a large brick wall visible from the street. The simple installation included a standard data projector and laptop computer. In order to soften the visible edge of the projection, masking tape was affixed to the front of the projector, as shown in Figure 4. This is necessary because even when the content is black, the projector still casts some light, creating a ‘frame’ at the edge of this projected light. As the animated models have no background, this removal of the edge of the projection creates a visual suggestion that the model is present in the space. As the projection location for Plasmatic No.1 was known before the production was finalised, the lighting conditions in the space were implied when lighting the 3D model. This included a primary light from the upper right, the direction of the street, and main direction of ambient light.

Figure 4. Installing Plasmatic No. 1 at the Gertrude Street Projection festival, 2014.

This subtle claim on veridicality, supported by the animation style which includes a sense of inertia and momentum helps the audience to accept the initial visual proposition that the
projected model is present in the exhibition space. This presence is then confounded by the metamorphic nature of the animation, heightening the uncanny or bizarre perceptual effects of the transformations.

A time-lapse capture from inside the shopfront on one of the nights of exhibition showed that there was significant interest in the work. The setting provided both an attractive, open and visible location as well as the opportunity to dwell at the location and observe the full loop of animation. In retrospect, Plasmatic No.1 is perhaps the most successful of the three works, as more time was invested in its production and by chance, the final forms worked best together.
As part of the 2014 International Symposium on Electronic Art (ISEA), Plasmatic No. 2 was included in two exhibitions curated by Joshua Watts. The first was at the Maraya Art Park located at the Al Majaz Waterfront, Sharjah. The most interesting feature of this space is a large camera obscura/exhibition room in the centre of the park. For the ISEA exhibition this structure was surrounded by 4 large projection screens.
The primary audience for this exhibition was delegates to the ISEA event, as well as casual visitors to the park. In contrast to the first exhibition of *Plasmatic No.1*, this exhibition allowed viewing from a greater distance, meaning that more attendees could see the work more casually and more frequently. The layout of the park area in contrast to the urban setting of the Gertrude Street Projection Festival meant that the audience was not forced to view *Plasmatic No.2* exclusively.

Interesting juxtaposition and staging was provided by the unique form of the camera obscura and the Mosque and commercial buildings in the background. At one point the exhibition was accompanied by the call to prayer.

There were a large number of incidental viewers – those simply passing on their way to the other facilities at the waterfront area.
The use of short throw projectors meant that there was no interference with the projection space - the audience were comfortably able to move around the space, including approaching quite close to the projections, allowing the display to fill their field of view.

Once again, the general situation of the exhibition was known before Plasmatic No. 2 was completed. In this case, an attempt to subtly integrate the model into the site was made by including a reflection on the object that reflects an image of a park at night, with a couple of palm trees above grass. This image can be seen only occasionally, and is intended to link the installation to the site without the audience noticing its inclusion.
The second exhibition at ISEA 2014 was located in the restored, historical Al Fahidi district in Dubai. This exhibition presented new challenges, as the projection spaces were within modestly scaled traditional house buildings. Though air conditioned and painted white, these spaces are otherwise traditional in design. *Plasmatic No. 2* was located within a converted gallery space approximately 3.5m wide and 6m long.

While it was beneficial to show the work in a more formal gallery setting, this exhibition was ultimately a less effective arrangement for this work. There were far fewer ‘incidental audience’
encounters, despite the exhibition being fairly well attended. As the exhibition space was smaller and somewhat secluded, there was a greater chance that the work was overlooked. The audience seemed less likely to talk with others in the confined, silent and more formal space. This led to shorter viewing experiences compared with when the work was exhibited outdoors (or in comparison with *Plasmatic No.1* at the GSPF). Often the time spent observing the work was less than one full cycle.

With the exhibition taking place in a small, white gallery, obviously the subtle reflection of a park at night no longer served to integrate the work into its setting. This was also the case at a later exhibition that took place in an urban laneway. Though the context of exhibition is always important, these works were never intended to be site specific, and the reflections were omitted from *Plasmatic No. 3*.

The exhibitions of Plasmatic No. 2 were somewhat poorly documented.
The white night festival concept originated in St Petersberg, Russia and now includes 15 locations globally. In this one night event, light and projection based artworks are displayed in open galleries and museums as well as in public spaces from 7 PM to 7 AM for a single night. The event in Melbourne in 2015 was curated by Andrew Walsh, and attended by over 450,000 people (Cuthbertson, 2015).

Figure 12. The White Night 2015 event in Melbourne attracted over 450,000 visitors.

White Night 2015 presented an excellent opportunity to show all three of the Plasmatic works as a collection. Having learned from the experiences of the GSPF and ISEA, the choice to exhibit in public space to high volumes of both intentional and incidental viewers suited the work well.
Following the White Night event, *Plasmatic No. 1 and No. 3* were exhibited at the site for 30 nights.

As mentioned above, *Plasmatic No. 3* was rendered without any integrating reflection effects, but as with *Plasmatic No. 1*, the strong lighting from the right was in both the digital rendering and the exhibition situation (see Figure 13) served to provide subtle visual indicators of presence.

The three primary creative works submitted for examination form an encapsulation of research results. The epistemological operation of these works as knowledge embodying artefacts is detailed in section 3.5.

In exhibition, the installed projections are offered to the audience without explanation, context or elaboration (beyond the titles). The audience may find the visual phenomenon confounding. They may seek some narrative explanation of the changing images. This seeking for patterning and explanations of phenomena is a natural and anticipated reaction, that is explored in later sections. These ‘live’ experiences form an important part of the knowledge and value proposition of this submission, as explained above in section 1.1.

Figure 13. *Plasmatic No. 3 at White Night Melbourne, 2015.*
2. BACKGROUND

"The old brain is the mental link to the whole bodily matrix of your make-up and I believe the old brain can divine genetic information and bring it forward in vague proximity to the new brain of the intellect, sufficiently so for the new brain to grab hold of it as part of a cognitive process, and divine some fantastic insights and discover some truths."

(Len Lye, in Scott, 2001)
2.1 THE STREAM OF THOUGHT

In 1890, William James published the *Principles of Psychology*, which contained a now famous section, chapter XI, titled *The Stream of Consciousness* (James, 1983). In this section, James sets about systematically describing the nature of consciousness as it exists in, and relates to time, starting with what he calls the ‘fundamental fact’, that “consciousness of some sort goes on. 'States of mind' succeed each other” (James, 1983). While it is now contended in some circles that consciousness does not indeed ‘go on’ (Daniel Dennett being perhaps the most well known and most controversial claimant that consciousness is an illusion), at this early stage in the development of the field of psychology, James established a rigorous and descriptive - if not explanatory - basis for a discussion of personalised, knowable internal states and experience. James acknowledges the difficulty in stating any real knowledge about what a personal consciousness might entail, stating that “Its meaning we know so long as no one asks us to define it, but to give an accurate account of it is the most difficult of philosophic tasks.” (James, 1983).

One firm assertion that James did make was that “consciousness is in constant change” (James, 1983). Clarifying that what is meant by this is that within each personal consciousness, consciousness is not ‘without duration’, and this duration inevitably leads to change in the experiences of consciousness. Even when exposed to identically recurring experiences or objects of attention, these objects of attention never give exactly the same internal subjective experience, as the perceptual experience is always a product of the interaction of the object with our personal state in time; a state that is constantly changing, evolving and responding to its changing conditions. James states that there is an impossibility of an object arriving for apprehension by an “unmodified brain” (James, 1983). This sense that a brain can never be ‘unmodified’ is reminiscent of the pre-Socratic philosopher Heraclitus’ observation that it is impossible to step into the same river twice – not only because it is not the same river but because the one stepping in is also not the same (Graham, 2011). Heraclitus calls this basic reality of all things being in states of constant change ‘flux’, epitomised by the phrase ‘panta rhei’ - ‘everything flows’ (Seibt, 2016). Both the object and the subject experience, or are a part of this flux, and Heraclitus is hence considered to be the first (Western) process philosopher. So along with a process approach, there is a common ontological premise between Heraclitus and William James that perception and the relationship between objects of perception and the internal states they give rise to, or correspond with, are in constant, interrelated states of transformation.
James’ rationale for the adoption of the stream as a metaphor is that the experiences of consciousness feel as though they go together, even when they are temporally distanced and that changes in those internal conscious experiences are never abrupt.

Such words as ‘chain’ or ‘train’ do not describe it fitly as it presents itself in the first instance. It is nothing jointed; it flows. A ‘river’ or a ‘stream’ are the metaphors by which it is most naturally described. In talking of it hereafter, let us call it the stream of thought, of consciousness, or of subjective life (James, 1983)

James’ description of the temporal qualities of the stream of consciousness indicates that an enquiry into the artistic visualisation of thought must be one that can facilitate the visualisation occurring through time as process and as experience, and to somehow capture these attributes as visual artefact.

James describes two qualitatively different key phases of thought within the stream which are differentiated initially by their pace. These 2 phases are compared to the behaviour of a bird, and described as seeming to be “an alternation of flights and perchings” (James, 1983). The more technical assignation for these two phases are ‘substantive’ and ‘transitive’. The substantive phases are the perchings; periods of relative stability of consciousness, or focussed thought, while the transitive are periods where thoughts are more mobile, shifting;

“at all times towards some other substantive part than the one from which it has just been dislodged. And we may say that the main use of the transitive parts is to lead us from one substantive conclusion to another.” (James, 1983)

It happens that animation is very well suited to the visual display of change over time. Further, certain types of animation may have properties that can represent this oscillation between fixed internal states of consciousness and a transformative mobility that constantly tends towards new visual conclusions.

2.2 SURREALISM AND (UN)CONSCIOUSNESS

James’ observation that accounting for consciousness was problematic would be made even more so by new theories in psychology that emerged during the early part of the 20th Century that identified the possibility – even likelihood - that consciousness is only a small part of the total contents, or processes of immediate internal experience.
Though Sigmund Freud is sometimes credited with being the first to establish a theory of mind that included a concrete explanation of the existence of the ‘unconscious’ (Eagleman, 2011), Freud was far from the first to explore the mind in terms that included aspects of mental processing that were not ‘conscious’ in the sense of being the products or topics of attentive focus. Guy Claxton (2005) describes Freud not as the ‘architect’ of the unconscious, but as its ‘archaeologist’.

The term "unconscious cerebration" was used by William Carpenter in 1874 to describe neuronal activity not associated with conscious thought (Carpenter, 2011), though the idea of sensory perceptions of which we are unaware can be traced to at least the beginning of the 18th Century. Gottfried Liebniiz used the term petites perceptions to describe knowledge of the internal state which is not made available to reflection or ‘apperceived’ (Kulstad & Laurence, 2013) and Johann Herbart described the limen, or sensory threshold from where we get the terms liminal (and subliminal) (Kihlstrom, 2007). Despite these early indications, the discourse on mental processing within psychology, philosophy and science from this time did not yet broadly accept that there were differences not just in types of thought, but in one’s awareness of those thoughts.

For many, the 19th century view was that mental life included only the conscious experience (Cleeremans, 2001). In 1906, an article was published in the Journal of Philosophy questioning whether the term ‘unconscious cerebration’ had, even at that time outlived its usefulness. A. H. Pierce questioned whether outside of ‘fully conscious cerebration’, ‘unsolicited cerebration’ and ‘vaguely conscious cerebration’ (the domain of the subconscious), there was any other type of cerebration that could be attributed to an ‘unconscious’ at all (Pierce, 1906). Pierce’s conclusion was that there was indeed such cerebration, but that there was a risk in applying the term uncritically to cases that may be better explained by the terms ‘marginal consciousness’ and to mental experiences and actions that are that were involuntary or unintentional.

Freud’s structuralist view of the human psyche posited separated functional domains of the mind through which memories and experiences are understood and instinctive forces of desire motivate the human experience, moderated by learned behavioural expedience. Freud believed that the unconscious was dynamic, causal and was a repository of mental content and memories (Freud, 2006v).

It was recognised almost from the time of William James’ Principles of Psychology that it was quite normal that if the conscious attention was separated from a task, the body could carry on with that task ‘mechanically’, in a process that was called ‘motor automatism’. But this process was regarded as essentially non-creative from a psychological point of view, capable only of
regurgitation, of continuation or of repetition (Solomons & Stein, 1896). But as Freud developed
his techniques of psychoanalysis and free association these techniques were taken up by artists
who sought to attach their automatic art practice to what was seen as a revolutionary
understanding of the structure of human mind and experience.

There is, of course ‘start’ to the artistic practice of attempting to visually express the function of
mind. The visual arts throughout history have always necessarily dealt with the existence of
internal states, and the manifestation of internal impressions and interpretations, even when
external perceptions were the ostensible objects of depiction.

In the early 20th Century, artists from the Dada movement began to deliberately experiment with
techniques for expressing the internal experience of both the conscious and the unconscious,
informed by the psychological theories of the time. Tristan Tsara and Francis Picabia were the first
to publish records of ‘automatic writing’, a semi-controlled verbal record of the stream of
thought, believed to be constituted of unconscious impulse in a state not controlled by rational
reflection. This process was largely analogous to Freud’s therapeutic ‘free association’. As early as
1916, Hans Arp made ‘automatic’ collages composed according to the laws of chance (Laxton,
2009). As the Dada movement evolved and revolted into Surrealism, these techniques as well as
others that met with the approval of the highly political surrealist movement were collectively
termed ‘psychic automatism’, and used as a defining term for the early surrealist movement.

Andre Breton specifically offers Freud thanks in the seminal document of the Surrealist
movement, the Manifeste Du Surrealism of 1924 for illuminating the nature of mind, an
“authorising” exploration beyond “summary reality” (Breton, 1974). In this same document,
Breton defines the new artistic movement thus:

SURREALISM, n. Psychic automatism in its pure state, by which one proposes to
express -- verbally, by means of the written word, or in any other manner -- the
actual functioning of thought. Dictated by the thought, in the absence of any
control exercised by reason, exempt from any aesthetic or moral concern
(Breton, 1974).

So rather than a collective definition or association through particular production techniques or
subjects, Breton claims (at least initially) that surrealism is the use of psychic automatism to
express the functioning of thought. This practice of psychic automatism defines what is
sometimes thought of as the first period of surrealism (Ades, 1978), and ties it to a Freudian
topology of mind, exploring the connection between the conscious and unconscious aspects of the mind and the representation of this link.

Psychic automatism from the early surrealist period is most often associated with automatic writing and automatic drawing, as well as techniques designed to introduce chance into the production of visual and written works, such as decalcomania (a form of semi-controlled contact printing) (Gibson, 2009). These formats present unique and individual challenges when considered from the point of view of (even then) established views on the nature of consciousness and its relationship to time.

Writing (along with other language-based art forms), is a medium that is experienced through linear time, since for the reader, time necessarily elapses as they read the text sequentially. Because of this sequential nature, the temporal extension introduces issues of change, and of associative meaning making as concepts are linked over time.

Drawing (as well as other visual and plastic arts) invites the viewer to experience the fixed spatial arrangements and relationships of the finished artworks as moments, apparently frozen in time. Both the production of these works and their extended appreciation of course also require the passage of time, but on a basic level there is a key difference here between what we can call ‘static’ artworks, and those that necessarily utilise the passage of time, sequence, rhythm and movement as a part of how the medium functions. This presents a problem for the static visual arts like making claims to be able to present a ‘record’ a consciousness that is by its nature, in a state of constant change (after James), or a state of flux (after Heraclitus). Each artform presents its specific insights into the process of translating interior thought experience. It seems that animation offers the opportunity to marry the spatial nature of automatic visual arts with the temporal aspects borrowed from automatic writing. Animation can record and present a sequence of visual thought impulses without the compression of the experience into a non-temporal state.

It was recognised early in the development and expansion of surrealist automatism that one of the key inhibitors to creating a record of the unconscious was the necessary speed of transcription. Relative to the experiential time of a reader or viewer of artwork, how quickly does one think? This problem plagued the ideal of the Surrealists to become mere “modest recording instruments” (Breton, 1974). In *L’amour Fou (Mad Love)* (2001), Breton makes the comment that “thought happens in the mouth”. The suggestion is that the unconscious impulse (the thought) can connect to the means of production (in this case, the mouth) without the intervening step of
cognition, reflection or other consideration and thus also removing the impulse for censorship, modification, or otherwise re-formatting to suit audience, culture, purpose or sensibility.

The speed of transcription was one of Breton’s initial hesitations in the extension of the practice into the visual medium. Breton was subsequently convinced by the work of Andre Masson and others who breached the temporal linearity of automatic writing, but in doing so managed to access visual mental data, with Breton himself admitting that his own initial surreal visions came to him as imagistic forms, and it was simply his inclination as a writer to translate them into poetic constructions based in language (Breton, 1974).

2.3 COGNITIVE SCIENCE AND THE UNCONSCIOUS

The surrealists of the early 20th Century operated in a historical context where knowledge of the unconscious was dominated by the emerging ego-centric view of psychic arrangement championed by Sigmund Freud. Freud’s theories, while having a huge impact on the direction of the development of psychology and psychoanalysis over the last century, have largely been supplanted by the cognitive revolution of the 1950s and by the progression of behaviourism, functionalism and neuroscientific approaches to understanding consciousness, imagination and the phenomenon of mental imagery.

The concept of the unconscious prevalent through Freud, Jung and the psychoanalytic tradition has been referred to as the affective unconscious (Kihlstrom, 2007). While it has been described in detail by various psychologists and philosophers, this is a view of the unconscious defined initially by the simple inclusion of all non-conscious phenomena and mental activity.

But this simple binary definition thorough exclusion proves problematic. There are instances of experience that seem to move across this boundary – destabilising the definition of the unconscious. For this reason, philosopher John Searle prefers the term nonconscious processing. In adopting this approach, he implies that there are thoughts that are not necessarily unconscious due to some repressive force as Freud may suggest, but rather have some other functional properties, different from the type of content found in conscious thoughts. In an effort to clarify a distance from Freud, Jung and others, these non-conscious processing activities are sometimes referred to as the cognitive unconscious (Kihlstrom 2007).

Searle presents a model of consciousness as a ‘field of awareness’ (Searle, 1992). This field has a centre of attentive focus, yet this attention is not synonymous with consciousness. Instead, Searle’s model allows that consciousness also includes all qualitative, subjective experiences...
which the attentive focus may be shifted to, offering as an example the feeling of the shirt against
the back of your neck. You can notice this feeling easily when prompted, and can then turn your
conscious attention towards it, but without the prompt, it is unlikely to often capture much of
your attentive focus. This periphery of consciousness implies a spectrum or falloff zone, a
consciousness based on priority, attention switching and temporal immediacy. This model of an
awareness field seems to have been inspired by Sartre’s description of self-reflective
consciousness as a flashlight, using the properties of a beam of light as a metaphor for the
directed ‘intentionality’vi with which one seeks and turns attention to an object (of
consciousness). In the relevant passage of The Imaginary: A Phenomenological Psychology of the
Imagination (Sartre, 2010), Sartre describes this light as both ‘transversal’ and ‘diffuse’. It is
transversal because it is descriptive of consciousness as a process, creating a relation between
subject and object, while defining neither. And diffuse, as in the sense used by Searle – it is soft
edged, and open to movement, intrusion and mobility.

The movement of new stimuli from either internal, spontaneous thought or sensory involvement
with the external world into conscious awareness is clearly complicated, and in some ways, an
explanation of this process would resolve the ‘mind-body’ causation problem in the philosophy of
mind – how does the physical, neural existence and operation give rise to the subjective
experience of consciousness? While not seeking to contribute an answer, in engaging in this
research of free input of instinctive, improvised and exploratory creation, it remains a central
topic for description, if not explanation.

Khilstrom et al, differentiate between the existence of unconscious content, described as ‘implicit
memory’, and the process phenomena of ‘implicit thought’, and ‘implicit perception’ (Schacter,
1987, Kihlstrom et al 2000). Kihlstrom describes that a mental idea or image (the implicit thought)
can undergo a process whereby intuition leads to incubation and then emergence of the idea into
consciousness (Kihlstrom 2007). Implicit thought’s manifestation into consciousness from this
cognitivist stance is loosely relatable to the process of surrealist psychic automatism, with the
qualification that psychic automatism implies not just the thought but also the process of some
act of realising those thoughts – some additional, but importantly integrated creative act.
Surrealist automatism utilises writing, or drawing, or printmaking as a method of incubating the
implicit thoughts, and uses these respective media as a form of consciousness, or as a means of
communicating consciousness.

The process of having ‘non-conscious’ thoughts without having awareness of those thoughts is
certainly altered by this process of emergence into consciousness and subsequently acting on
those thoughts – as an artist recognises a thought and acts on it in some generative way, the thought is made explicit, but the origin of these types of generative artistic thoughts can still be equated, being neither (entirely) percepts nor memories (representations of current or past events). Considering this under the view of Searle’s field of consciousness, percepts and memories may intrude from peripheral consciousness – may capture the attentive focus and hence the creative act is never truly ‘unconscious’. Axel Cleeremans (2001) explains that no cognitive task can be said to have ‘process purity’ – both the creation of art works and their reception will include a combination of conscious and unconscious activity.

2.4 UNCONSCIOUS ANIMATION

The notion that an improvised art form could record or communicate something of the interior experience, particularly visions of the ‘unconscious’, coincides with the invention and popularisation of animation as a medium. The first part of the 20th century saw a coincidence of technological innovation in the moving image arts, art movements (such as dada and surrealism), and geography. Growing out of optical image toys that characterised pre-film animation in the 19th century, animation has always been a technologically intensive medium. Experimentation with these technologies is fundamental to animation. There is a symbiosis in the history of experimental animation between auteur artists who found new means of expression in animation technology, and innovators who, in the course of their work, invented new types of image and image making.

One aspect of experimental art is unfamiliarity. This unfamiliarity challenges both practitioners and audiences as they work (collectively) to understand the implications of new forms of art, if any. In this sense, experimental art can be thought of as ‘self questioning’ (T. Smith, 2012). The experimental also often serves as an auto-record of the process of production – a trace.

The persistence of vision, now considered a mythical (Anderson & Anderson, 1978, 1980) or historical explanation for how we can see static images as mobile underpins a history of experimental animation that translates from the mental, to the material, to the screen. This ‘persistence’ is an attribute of temporality, and one that separates it from precedents in the visual arts.

There is a history of animation that captures, in animated form, records of practice that express an experimental persistence. In The Technique of Film Animation, Halas and Manvell state that “experimental films normally germinate in the heart of the medium itself” (1978) and in the case of experimental animation, this historical heart revolves around vision, time and the crafted
image. Since artists were seen to be simply “modest recording instruments” Andre Breton identified that for psychic automatism, one of the key requirements was a medium that would allow works to be produced at transcription speeds able to keep up with the progression of thoughts (Breton, 1974). Animation is typically an arduous process and almost always involves investing much more time into an individual frame than it is experienced for in the finished work. Schaffer, discussing Deleuze’s cinematic ‘instants’ addresses this temporal distortion in animation, and identifies the double register of time: the experiential time of the viewer as distinct from the time relevant to the creator (Sinnerbrink, 2008).

Though an interesting goal, most forms of animation would fail Breton’s implication that the production should be temporally synchronous with the thought impulses that inspire it. While always presenting a temporally modified version of internal impulse, as a register or recording medium, animation has fundamental properties that facilitate certain forms of expression unavailable to other mediums. This expression is always mediated by technology through which the artist experiences and expresses image and time. The category of animation likely to fit this role as direct, if imperfect recording device of the internal impulse is ‘straight ahead’ animation, where the animator works on frames of the final sequence in order, completing one before moving forward to the next. Some technologies impose this straight ahead approach by their nature.

Two animators who represent this dual role of inner expression and integration of technology are Len Lye and Norman McLaren. Lye was overtly interested in the process of interroception and accessing interior mental impulse which was then expressed visually, claiming:

"The old brain is the mental link to the whole bodily matrix of your make-up and I believe the old brain can divine genetic information and bring it forward in vague proximity to the new brain of the intellect, sufficiently so for the new brain to grab hold of it as part of a cognitive process, and divine some fantastic insights and discover some truths." (Lye, cited in Scott, 2001)

Lye specifically distanced himself from the surrealist movement, despite having exhibited some work in surrealist exhibitions (Lye & Curnow, 1980), his rationale being that "My work doesn’t relate to dreams in any shape or form, nor the unconscious" (Scott, 2001). Despite this deliberate distancing, with Lye preferring to consider his work as being influenced by the ‘pre-conscious’ rather than unconscious mind, there is a similarity in some of the practices and approaches between the automatic period of surrealism and Lye’s animation practice. For example, Lye worked with automatic drawing. Later in the film Free Radicals (1958) Lye uses the direct
animation technique of scratching directly into film stock, using muscle memory to bridge the temporal gap across the frames, and responding intuitively to internal visual impulse, reflecting his preoccupation with “the kinetic of the body’s rhythms” (Cantrill, 2002). This direct animation is produced without a camera, as the film stock can be projected ‘directly’ without further processing – one strategy for handling the influence of technology in the translation from mind to hand to screen is to minimise it. Lye is also said to have focussed on experimenting with separate aspects of animation individually, a tactic that will be revisited in sections of this document that discuss process.

Another giant of Animation history who also used the techniques of direct animation is Norman McLaren. When Giannalberto Bendazzi uses the term “Visual Jazz” (2016) to describe McLaren’s Blinkity Blank (1955) this is not just a reference to the musical accompaniments, but an indication of a common approach between the musicians, with their instruments as tools and their music as materials and the animator with his tools of production and visual mark making materials. Straight ahead animation, like jazz, requires a sense of progressive improvisation, a topic that will be explored in depth in section 4.

McLaren summarised four key elements for successfully handling the machines required for his productions:

1. “Attempting to keep at a minimum the technical mechanism standing between my conception and the finished work.
2. Handling personally the mechanisms that do remain, in as intimate a way as a painter his painting, or a violinist his violin.
3. Making the very limitations of these mechanisms, when brought in touch with the theme, the growing point for visual ideas.
4. Making sure of a chance for improvising at the moment of shooting or drawing” (Graca, 2006).

McLaren was not fearful or resistant to utilising technology. In Around is Around, (McLaren & Lambart, 1951) McLaren used an oscilloscope, which creates abstract elliptical and parabolic curves and waves. To re-imagine the possibilities of this scientific imaging technology shows a willingness not only to utilise new tools, but to appropriate and re-purpose these tangential technologies. This film was also projected in stereoscopic vision, one of four ‘3D’ films made by McLarenvii.
This purposeful combination of minimising of the distancing effects of technology and integration of the natural properties and advantages offered by technology is no less relevant when considering improvisational and intuitive practice with digital tools than with the cameras and mechanical equipment of McLaren’s era.

2.5 THE ORIGINS OF THE PLASMATIC IN ANIMATION

The etymology of the term plasmatic is Greek, via Latin, from the term ‘plasma’ that literally means mold, or shape. The term plasma is also used referring to the colourless, suspension fluid of the blood, or a substance containing charged particles, such as molten salt or metal (Oxford Dictionaries, n.d.). There are relations to the term ‘protoplasm’ – the formless interior of a cell in which the other constituent parts are suspended – and this re-enforces both the biological connotations of the term as well as the sense that it is a medium within which other entities exist, are contained or ‘live’. There are direct connections to the Greek term ‘plassein’, to the process of shaping, and from where we get terms like ‘plastic’ (Oxford Dictionaries, n.d.). Plastic, in turn refers not only to a material that has mouldable qualities, but is also a property of being able to be moulded or being able to be formed to purpose.

There is also a correlative adoption of the term plasma to refer to non-solids, or what may be referred to as fourth states of matter, being neither solid, nor liquid, nor gas. Highly conductive, plasma is characterised by the influence of an electrical charge within the material, as the charge is distributed amongst the material. Plasma can be said to be a state of potential due to this highly conductive nature. Lightning at the earth’s surface, and nuclear matter within stars are examples of plasma, and it can be used in specialised industrial machinery for tasks like cutting through metal with a focussed plasma stream. It is as this fourth state of matter that the term plasma is most useful in referring to animation.

In animation studies, the term plasmatic is attributed to director and film theorist Sergei Eisenstein who commented extensively on the work of his friend Walt Disney in the early 1940s. Eisenstein’s written work on Disney focusses on attempts to grapple with what Naum Kleiman called a foundational problem for Eisenstein in understanding how art operates - both as a creative act and as a structured work being perceived by a viewer. This “problem may be defined as the correlation of the rationally-logical and the sensuous” (Kleiman, 1986). Eisenstein attempts to account for attractiveness in art and tried to assess aspects of a creative act and creative work to ensure that as artworks become more complex (as in the case of animation or film), they do not lose their appeal to “prelogical” forms of thought (Kleiman, 1986).
In reflecting on the elasticity in Disney’s *Alice In Wonderland* (1951) as Alice grows and shrinks, and comparing this with other literary examples of characters with non-human elasticity, Eisenstein connects the strange physical behaviour with visual wonder in prelogical thought thus:

“What’s strange is not the fact that it exists.

What’s strange is that it attracts!

And you can’t help but arrive at the conclusion that a single, common prerequisite of attractiveness shows through in all these examples: a rejection of a once-and-forever allotted form, freedom from ossification, the ability dynamically assume any form.

An ability that I’d call plasmaticness” (Eisenstein, 1986)

Eisenstein goes on to explain that it is not a lack of identifiable form that defines this property – at various stages entities in question have certainly attained definite form, but it is a form that is unfixed, unstable, and capable of representing all forms (ibid). It is this potentiality that is attractive to Eisenstein, a compelling ability to represent while at the same time defying our attempts to allot a stable ontological status to the entities we see animated before us because the defining characteristic is that they may at any point shift categories.

This confounding potentiality is a feature of the structural nature of Disney’s narratives as well as a perceptual effect for the viewer. This potentiality in visual form and narrative addresses allows themes of mutability and potentiality beyond mere fixed form to serve as visual analogies for issues related to freedom in culture and society. This is a freedom that Eisenstein assesses as fictitious and comical – a mere interlude from a ‘conveyor belt’ life “during which the viewer himself remains chained to the winch of the machine” (ibid). If we cannot preserve the prelogical, the instinctual, we seem doomed to be stuck forever on the conveyor belt of modernism.

Although Eisenstein was primarily describing early Disney films in particular and not animation in general as an artform when using the term plasmatic, productions at the Disney Studio did not maintain their sense of plasmaticness as they evolved. As Paul Wells describes, in the period of around the late 1930s, as artists at Disney enhanced their animation craft by incorporating more realistic movements and behaviours, “Disney moved further away from plasmatic flexibility of many of the early Silly Symphonies and coerced the animated form into a neo-realist practice” (Wells, 2013). This neo-realist shift was characterised by visual principles such as the preservation of volume, and a tendency to conform to character designs – a tendency that makes natural sense.
in terms of industrial production, creating a common and stable reference for all artists animating a character. The plasmatic nature of animation practice is clearly more than a visual on-screen effect. The graphical “anarchy” (ibid) giving way to moral realism was indicative of an ideological shift.

In a 2011 article, Yuriko Furuhata proposes that plasticity and ‘plasmaticness’ extends beyond the visual images created in animation and is implicit not only in the broader conceptual and narrative structures of animation, but in the very production process which creates those images (Furuhata, 2011). Furuhata cites the work of Adorno and Horkheimer, as well as Walter Benjamin in reviewing a historical Marxist response to the post-Taylorist Fordism central to the regimented and mechanised production methods of the Disney studio. From this political point of view, the ironic gap between the jolly slapstick cartoons being produced and the highly industrialised processes and working conditions involved in their production is seen as an ideological instrument of deception;

“In the eyes of Adorno and Horkheimer, Disney’s animation films were nothing but the ‘after-images of the work process’ so thoroughly mechanized and regimented under the Taylorist-Fordist mode of production (ibid).

There is a direct continuation from the issue of early industrialisation in animation production to the organisation of work in 3D animation software. The post-Fordist industrial reality and modern digital production arrangements may not be entirely analogous to a ‘production line’ but there often remains a sense of procedural mechanisation in the use of 3D animation software.

Fordism relies on the use of specialised tools to break down complex tasks into simpler ones, lowering the levels of skill and craftsmanship required to manufacture an object (or in the case of animation, a moving image). Chains of these simplified and specialised tasks and their associated machinery are then connected into production lines, with the advantage that the task modules are more easily replaceable and lend themselves to optimisation. Fundamental to this approach is the idea that the components are arranged in a way which is designed to most efficiently achieve a pre-determined outcome. The organisation of tasks within the code structure of the software as well as the organisation of human labour and inputs still loosely follow what may be referred to as a technical rationalist approach of specialisation, task sequencing and automation.

This research required that there be no pre-determined result to work towards, no outcome established prior to the tasks of its creation. Furuhata’s claims that plasticity can extend beyond
the image into the materiality of production are embraced, claiming improvisational practices as ‘plasmatic’ in contrast with more traditional animation production.

Plasmaticness then is no mere visual phenomenon or designed effect. Visually, conceptually and politically, plasmaticness emerges from - or is pre-empted by - the practices and orientations to animation production, including the organisational structures that surround it and the design of the integral tools of its realisation.

This research uses the practice of creating improvised animated metamorphosis as a means of interrogating both the nature of this plasmaticity in visual form and in animation practice, including the personal political implications inherent in doing so - particularly those political issues that relate to our relationship with industrial tools of expression. The analysis of this practice and its links with theories in animation studies encounters philosophy, neuroscience, and art (animation) theory. A fluid and adaptable methodology is required to account for these broad inputs.
3. METHODOLOGY

“The meaning of a film is incorporated into its rhythm just as the meaning of a gesture may immediately be read in that gesture: the film does not mean anything but itself. [...] The joy of art lies in its showing how something takes on meaning – not by referring to already established and acquired ideas, but by the temporal or spatial arrangement of elements.”

(Merleau-Ponty, 1964)
This section of the dissertation explains the methodology by which the research aims are pursued. Practice based research is the primary methodology. The activities during the research are structured by the model of the ‘Iterative Cyclic Web’. For the animated artworks presented to be considered as knowledge embodying artefacts, they rely on the ability to communicate tacit knowledge and both the production and the reception of the knowledge involved rely on phenomenological epistemologies. These methodological frameworks underpin both the activities of conducting the research and also the basis for reflections on the artworks produced.

3.1 PRACTICE BASED RESEARCH

In the creative arts, practice based research is a branch of qualitative research that incorporates creative practice as a part of the research process and/or as a means of communicating results and new knowledge.

“Within creative practice, the role of research is first to enhance personal effectiveness through conscious individual reflection and second, to provide a more systematic understanding of how people interact with artworks.” (Candy & Edmonds, 2011)

Following the model of Candy and Edmonds, this research is conducted through practice for two key reasons;

- Firstly, the research direction and the propositions raised inherently call for creative practice. As the aim of the research is to illuminate specific opportunities in processes and practices related to animation, it is not possible to conduct adequate experiments nor document the more successful of these new approaches to practice without actually engaging in, and reflecting on these practices.

- Secondly, creative practice and the artworks produced are required to make the findings and new knowledge available to an audience. There are aspects of the findings that can not be described in text.

As described by Chris Rust, "there can be valid research whose contribution to knowledge cannot be stated fully or precisely by the researcher. This is particularly relevant to research by creative artists,” (Rust, 2007). It is therefore necessary for the experimental practices, documentation of the experiments and workflow and appraisal of the created artefacts to be taken as collectively constituting the contribution to knowledge under the practice based research methodology.
The creative works presented are required for establishing claims about the ability of the metamorphic image to represent a unique behaviour of interior experience. The audiences for these artefacts are likely to have experience beyond what can be predicted in their making. Newly generated knowledge in the form of these experiences is thus disseminated through the exhibition and viewing of the artworks created.

Practice based research does not always proceed from origins that can be clearly articulated as traditionally formatted questions. As explained in section two, this research extends from what Haseman calls “‘an enthusiasm of practice’: something which is exciting, something which may be just becoming possible as new technology or networks allow (but of which they cannot be certain)” (Haseman, 2006). This is a fitting description for the motivation and emergent process of this research where initial ideas about improvisation and animation were accelerated towards outcomes and findings by excitement at the discovery of the possibilities of executing this work in new mediums and software solutions.

3.1.1 PRACTICE BASED AND PRACTICE LED RESEARCH

There is some minor terminological confusion amongst the range of disciplines that employ practice as part of a research methodology. In the creative arts, the terms used most widely are ‘practice based research’ and ‘practice led research’.

It is generally accepted that practitioner research can fall into two broad areas:

- research that utilises the production of artefacts and the pursuit of practice as a means of uncovering new knowledge, and
- research that has findings and ramifications that are of importance to a specific domain of practice (Candy & Edmonds, 2011; Haseman, 2006; Niedderer & Roworth-Stokes, 2007; Nimkulrat, 2007).

This could be summarised as a distinction between research by practice, and research for practice, a separation for which there is substantial natural overlap. There is a mixture of application of the terms practice-based and practice-led to these two types of research, which may arise from the fact that these terms are often applied interchangeably. For clarity, in this dissertation, the definition provided by Linda Candy is adopted: “If the research process is primarily based on the making of an artefact, the research could be said to be practice based. If the research leads primarily to new understandings about practice, it is practice led” (Candy & Edmonds, 2011).
This research project fits both of these definitions, so identifying as practice based or practice led is not of high importance. For example, in the following section describing the use of the research model called the *iterative cyclic web*, the terms practice-led research (and research-led practice) are used by the architects of that model, where the term practice based could just have usefully applied under the description above.

### 3.2 EXPERIMENTS

The experimental nature of this research should not be seen as empirical, or as implying a scientific process or approach. The word experiment derives from the Latin *‘experiri’*, meaning to ‘try’. Both linguistically and as a process, this experiri, or trying, leads to ‘experience’ and ‘expertise’. Though this is not implied by the term itself, the word ‘experiment’ has a popular connotation with the sciences, and in using the term in artistic areas, we adopt both explicit and implicit suggestions about process and outcome from scientific disciplines. Through language, these connotations may infect the activities of experimentation and experimentalism in animation.

Both artists and scientists conducting experiments may begin with a hypothesis. A hypothesis is a proposition that is made without an assumption of truth. In science, it is usually a proposed explanation of a phenomenon, or a proposition that describes a relationship between variables. Hypotheses are based on limited evidence but rely on underlying paradigmatic assumptions that emerge as a result of previous accumulated knowledge gathering cycles. One of Aristotle’s conditions for the demonstrative capabilities of ‘Scientia’ is that the validity of the premises must be known (or they would themselves require prior demonstration) (Kochiras, 2014).

Hypotheses are generated in science by inductive or abductive reasoning, meaning that they are often theories generalised from specific information, they are probabilistic, and arise from intuitions about explanations that seem most likely, given available evidence. These hypotheses are then used as the starting point and framing for the gathering of further demonstrative evidence that supports or disproves the proposed explanation.

This initial form of inductive hypothesis as emerging from an accumulated paradigm of knowledge certainly exists in artistic experimentation. The collected work of peers and precedents are our initial paradigms. The artist’s hypothesis however exists for a different purpose – the artist or animator doesn’t seek to *explain* a phenomenon. In my experience, an artistic hypothesis is instead a proposed *expectation*, or desire towards an anticipated visual phenomenon. In both cases, experiments are hopeful, but there is a contrast in the orientation of the practitioners.
involved – one seeks support for a proposition, while one seeks to witness, and involve
themselves in the creation of a phenomenon.

There are a range of logical arrangements that formally govern how a scientific hypothesis can
lead to an explanatory conclusion. To give a single example, the idealised ‘deductive-nomological’
model which grinds a hypothesis towards a conclusion of truth through a series of conditional
propositions (if X then Y, then, and, if U equals W and so on) until these nested premises link
together to form a reliable 'law' (Woodward, 2011). As a logical structure this can be applied
much more widely than in science. But in the creative arts, this switch from the inductive or
probabilistic to the deductive nested logic of proofs is usually unnecessary. It may even be
counterproductive to rationally attend to the apparent successes or failures of predictions,
because the unpredictable nature of the visual results over time makes them no less useful or
interesting in animation experimentation. This is a key difference in the orientation of the
practitioner – where the scientist scrutinises outcomes for confirmation of the hypothesis, in
artistic cases, the animator is likely more open to consider all information and all results as
potentially useful, whether or not they relate to the initiating ideas.

It is tempting to say art is inductive, rather than deductive as a way of describing this difference in
experimental orientation, but actually the difference is often simply that artistic experimentation
can be comfortably non-rational and that some forms of experimentation are non-rational
activitiesix.

3.3 A TRANSDISCIPLINARY STUDY

As a site of confluence of the visual arts, cinema, performance, design, craft, and sound,
animation as a medium is inherently interdisciplinary. Research in animation often requires
consideration of ideas and practices from a range of fields. As outlined in the opening sections of
this dissertation, this research draws on a wide range of fields and activities including psychology,
animation studies, art history, animation practice, philosophy, and cognitive science. This may at
first seem to be an unwieldy mixture of elements. This research proceeds from the root goal of
understanding improvisation in digital sculpture and animation production and each of these
elements recommends itself to this core task.

Building on the work of anthropologist Gregory Bateson, Alfonso Montuori identifies five key
attributes that identify a research project as transdisciplinary, all of which are relevant to this
research project. [Transdisciplinary research is];
“inquiry-driven, rather than discipline-driven

Meta-paradigmatic rather than exclusively intra-paradigmatic

Informed by a kind of thinking that is creative, contextualising and connective […]

Inquiry as a creative process that combines rigour and imagination” (Montuori, 2005)

So being driven by the inquiry into specific forms of improvisational practice in animation (point one), this research has attracted content and led to contextualisation in the range of disciplines mentioned above. In fact, the notion of ‘improvisation’ has been not only a topic of study and a method of practice, but to some extent, a method of research. Taking a meta-paradigmatic approach (point two) means that while this presentation of findings is quite structured, the research holds no strict priority for the application of one set of theories over another. For example, the paradigmatic presumptions of improvisation via surrealist practice and musicology carry equal weight to reflections on new artworks via neuroaesthetics and cognitive science (offered in section 5.2). This means that the scope of the research is intentionally open to the inclusion of facts, principles and knowledge from other domains. It is intended that the creative works will connect and contextualise these various theories (point three). The process of creating improvised digital sculptures that represent internal thought impulses is directly related to ‘imagination’ – this research is fundamentally about the ways in which the processes of digital sculpture and animation can relate to and express the functioning of one’s imagination. Yet the inquiry is structured and formalised in this document, and through the iterative process of preparing the experiments and documentation of the three key exhibited works for submission, thus satisfies list point four of Montuori’s definition for transdisciplinary research as having both rigor and imagination. The final point made by Montuori is that transdisciplinary research projects are inherently contextualised by the subjective position of the researcher*. The subjective position of the author in relation to this research is obvious, and is explored further in section 4.3.

In 1994 the First World Congress on Transdisciplinarity adopted a Charter of Transdisciplinarity. Article 5 of that charter states

“The transdisciplinary vision is resolutely open insofar as it goes beyond the field of the exact sciences and demands their dialogue and their reconciliation with the humanities and the social sciences as well as with art, literature, poetry and spiritual experience” (Nicolescu, 2002)
Though it may come at the expense of some depth in any one discipline or theoretical area, this research draws from the histories, humanities and sciences as well as from art practice.

A transdisciplinary study draws from a range of diverse disciplinary knowledge reserves and offers findings back to those disciplines that will have some benefit from the transdisciplinary contextualisation and investigation. In this way, disciplinary knowledge can be clarified by transdisciplinary knowledge and processes (Nicolescu, 2008). In particular, this research performs this function by bringing transdisciplinary knowledge to the field of animation studies, particularly in the area of theories regarding metamorphosis and discourses on animation practice and technology. Importantly, according to Nicolescu (2008), this does not create a new discipline, or ‘superdiscipline’xi, but allows transdisciplinary knowledge to clarify disciplinary knowledge.

A transdisciplinary, practice based research project as described calls for a research methodology model able to cater for the range of activities, outputs and disciplines involved over an extended practice and research period.

3.4 THE ITERATIVE CYCLIC WEB

This project adopts the model of the iterative cyclic web (Smith & Dean 2009) shown in Figure 14 which connects traditional academic research, practice-led research and what the authors of the model identify as ‘research-led practice’. This model allows the research to move from idea generation to a number of different output types, including artworks, traditional research papers and documentation of new techniques and methods. The iterative cyclic web allows multiple entry points (citing Deleuze’s ‘rhizome’ as analogous) and facilitates shifts between research phases which may naturally evolve from one research type to another (Smith & Dean 2009). For example, interpretation of new ‘academic’ research (on the upper left of the model) may result either in an output of research publications, or the researcher may move across the model and incorporate these new academic findings into practical applications and development of new techniques (on the lower right of the model).

In addition to flexibility of research direction and ability to account for an evolving research plan, this model was selected as it promotes the evolution of both practical and academic ideas to evolve into ‘research-led practice’. This bottom section of the model differentiates research-led practice from other types of artistic endeavour, and this is critical to understanding the works produced as knowledge embodying artefacts. This movement from practice to research-led practice, or in (at least originally) Aristotelian terms, to praxis, involves seeing the theoretical
underpinnings of the practice activities as an integrated and “mutually constitutive” aspect of the final activity (Carr & Kemmis, 1986).

Figure 14. The Iterative Cyclic Web, a practice led research model, re-drawn with permission of the original authors.

During this research, ideas have generally arisen as either ‘academic’ (often from contextual review of publications) or as ‘practical’ (arising from experiments with materials, software or processes) and the iterative cyclic web provides a framework for rigorous combination of these new ideas so they may be applied to the research aims.

This research includes a range of outcome types which can be located in relation to the Iterative Cyclic Web model. Described by the right side of the model, this research has led, by the systematic yet subjective development of ideas to outcomes in the form of artworks. These
artworks are presented to audiences and provide new experiences for these audiences, as outlined in section 1.1. In addition, the documentation of these artworks, submitted along with this dissertation, serve as records of practice that encapsulate the research findings. In the bottom section of the model, the research output types include new theories, techniques and paradigms for the production of improvised animation, and for the production and discussion of animated metamorphosis. The specific techniques are documented in this dissertation in section 4.1, while the discussion on theories of metamorphosis and the production paradigm of improvisation are described in section 5. This research has also led to formal academic outcomes, as pictured on the left side of the iterative cyclic web model. A summary of these academic activities and outcomes is included in Appendix 2, section 9.2. Overall, the iterative cyclic web provides a logical formal structure to the research process which is in this case intentionally open-ended and improvisational.

One of the advantages of the iterative cyclic web as a methodological model for practice based research is that it does not preclude other traditions and research paradigms from being implemented concurrently.

For the purpose of establishing new knowledge, how can the role of practice and the contribution of creative works be understood in the context of this research project?

3.5 TACIT KNOWLEDGE AND REFLECTIVE PRACTICE

A common model for the inclusion of creative practice in research is to provide first person reflections as a way of documenting and sharing the experiences of practice alongside the artefacts themselves. This reflection appears in section four of this document. The reflective-practice tradition of reflection in action (during the activity) and reflection on action (reflection after the action) formalised by Donald Shön is partially applicable to this research (Schön, 1983). Aspects of reflection in practice such as establishing a greater connection with feelings and emotions during practice apply directly to improvisation, supporting the aim and general premise in this research that the practitioner should be guided by naturally arising image impulse and material interaction. Some aspects of Shön’s reflection in action are incompatible with the premise and process of improvisation, such as the inclination towards an increase in conscious action, bringing specific attentive focus to decisions during the practice phase.

Michael Polanyi’s work on tacit knowledge (Polanyi 2009) provides an epistemological framework for understanding the methodology of knowledge creation and capture through practice and the means by which that captured knowledge, recorded as artworks is transferred to an audience.
Polanyi explains a model of tacit knowledge whereby (in part) one is able to attain inexpressible knowledge of a whole while holding only specific, expressible knowledge of features (Polanyi, 2009). This is a move towards holistic knowledge that occurs not by careful scrutiny of particulars, but through a process of ‘interiorisation’ of them. Polanyi offers the example of knowing the appearance of someone’s face; we cannot always readily say what it is we know of the face, even when it is intimately familiar to us, even though we can usually describe the features and their arrangement. This is not, however, the same as our knowledge of the face, which is immediate, unconscious and holistic. We may not even be aware of our knowledge of the face’s features until asked to describe how it is that we know it. In this case then, we can attend from featural, unconscious knowledge to holistic understanding, and indeed it is this very resultant holistic understanding that guides our attentional abilities towards the initial features:

“We may say, in general, that we are aware of the proximal term of an act of tacit knowing in the appearance of the distal term; we are aware of that from which we are attending to another thing in the appearance of that thing. We may call this the phenomenal structure of tacit knowing (Polanyi, 2009).

Again, it is not the specific and specifiable knowledge of these particulars that leads to greater knowledge or understanding for Polanyi, but their interiorisation. This fits particularly well with the practice methods of this research as it concerns improvisation – a process which does not usually involve the conscious application of knowledge, but relies instead on tacit and unconscious knowledge, skill and instinct.

In terms of an applicable methodology, Polanyi argues that tacit knowledge can guide research through three primary functions;

- By providing a means of knowledge of a problem
- By providing a means of pursuing a problem guided by anticipations of solutions, and,
- By providing a model for anticipating the implications of the solutions discovered.
  (Polanyi, 2009)

It is by these three main functions that Polanyi’s theory of tacit knowledge serves as a methodology for this research project. The ‘problem’ of this research is first approached as an instinct of the existence of an opportunity, a compulsion for a certain type of experimentation that cannot necessarily be fully, rationally explained. The means of pursuing these instincts through artistic practice, experimentation and an engaged process of temporally embedded material improvisation is similarly challenging to describe other than on reflection and with
reference to the describable features and reflections on the practice. And finally, the implications for the audiences and relevance to the discipline of animation studies can be anticipated as understandings about instinctive modes of practice and tacit knowledge about animated metamorphosis.

3.6 PHENOMENOLOGY AND THE ROLE OF CREATIVE WORKS AS KNOWLEDGE TRANSFERRING ARTEFACTS

Animated images offer unique opportunities for conveying knowledge based on their unique attributes. There must be some equivalence between the knowledge created and the means of encapsulating and conveying that knowledge.

3.6.1 PHENOMENOLOGY AND PERCEIVING ANIMATED THOUGHT

Phenomenology as a discipline in philosophy is concerned with the study of structures of experience or consciousness, originally established by Hegel and later extended by Husserl and many others. It is the study of phenomena as experienced from a first-person perspective, and represents the attempt to make these subjective experiences more accessible to empirical evaluation (D. Smith, 2013). This research is concerned with new approaches to the production of visual phenomena. Hence, a tradition of the direct study of such phenomena is applicable, as it accounts for the apprehension and transfer of non-propositional, and non-linguistic knowledge. This is useful and necessary in this research – the practitioner relationship with tools and virtual materials (discussed further in section 4.4) is enhanced, but not fully representable by the linguistic labelling and inevitable abstraction of those experiences that occurs through the application of language. Alfred Korzybski advocates that humans should become more ‘extensional’, meaning by this that we might extend beyond the linguistic level of meaning and abstraction that only ever ‘points to’ the world in a semantic or semiotic sense (Anton & Strate, 2012). According to Korzybski, behind this layer of linguistic abstraction lies the level of objectivity and of ‘events’. It is on this level of events that this research, and the practices central to it that seek connections between mind and virtual material occurs. This is then another rationale for conducting this research through practice, as it is primarily non-linguistic in nature.

In The Rediscovery of the Mind (1992), philosopher John Searle states as a part of his ‘opening assumptions’ that:
“It is a mistake to suppose that the ontology of the mental is objective, it is a mistake to suppose that the methodology of a science of the mind must concern itself with only objectively observable behaviour.” (Searle, 1992).

This research involves the creation of artefacts that reflect a performative expression of some internal states of consciousness and a visual representation of the arrival and departure of thoughts and of sequential thought progressions. As such, these artefacts are considered the products of an extended, materially embedded phenomenological enquiry – an enquiry into contents that are subjective in nature, and hence require a subjective methodology (after Searle).

In 1961, Merleau-Ponty claimed that “Only the painter is entitled to look at everything without being obliged to appraise what he sees.” (Merleau-Ponty, 1993) Parry and Wrathall interpret this claim not as meaning that the act of painting occurs without a curating selection of the object under observation and assessment of that object in terms of the requisite mechanisms of depiction, but rather to mean that even if the depictions are highly abstracted or manipulated, they must not be conveyed in an “incommensurable medium” (Parry & Wrathall, 2011). The painter offers the viewer a direct or ‘unappraised’ experience of the world – altered via the medium of brain and brush, but ostensibly analogous to the perceptions they experience if looking at an object directly. These visual presentations of phenomena by the artist are thus seen as substantially different to written texts, which, in a formulation similar to Korzybski’s layer of linguistic abstraction, must always say something about the world, rather than being a direct experience of it (Parry & Wrathall, 2011). If we accept that phenomenologically speaking, a painting can offer a direct experience that a written text cannot, then is it the case that this argument applies only to painting, and not to other image arts? Merleau-Ponty’s writing on the application of phenomenology to the visual arts often used painting as his prime example, but he also acknowledged that film has unique properties that facilitate the key process of phenomenology: direct access to ideas through perception, not through reflective interpretation.

“The meaning of a film is incorporated into its rhythm just as the meaning of a gesture may immediately be read in that gesture: the film does not mean anything but itself. [...] The joy of art lies in its showing how something takes on meaning – not by referring to already established and acquired ideas, but by the temporal or spatial arrangement of elements.” (Merleau-Ponty, 1964)

This acknowledgement that the elements that are perceived may come in temporal as well as spatial arrangement indicates that phenomenology can be applied to the moving image arts as
well as to the static visual arts, and has been done frequently, both in film studies and animation studies.

Of note in the field of animation studies, Dirk de Bruyn uses a phenomenological framework to analyse the performative and perceptual qualities of the short films of Robert Breer, noting the pre-reflective nature of these films that function unto themselves, without the need for a fully contextualised narrative (de Bruyn, 2007). Steve Fore similarly applies phenomenology in his analysis of the works of Jeff Scher (Fore, 2007). The common ground of a phenomenological approach in these cases is that both explore the abilities of animation to produce and communicate with the audience based on unconscious perceptual qualities of the works in question. This is a level of communication that occurs at a pre-reflective stage of perception, utilising the unique qualities of the medium of animation to engage with the perceptual and cognitive processes of the viewer. In the works of Jeff Scher, images proceed too rapidly for the audience to consciously digest them, forcing a reception of the animation as a holistic experience of movement, separated from the individual depictions within each frame. Similarly, de Bruyn cites the velocity of Breer’s sensory manipulation (in 69) and the intermittent rhythms of partial views from a train carriage (in Fuji) as relatable perceptual effects that enhance, rather than impede the ability of the films to connect with the audience’s experience (de Bruyn, 2007).

The moving image clearly offers a different sort of direct experience from the static visual arts—one that includes the dimension of time. This is not a small addition, since all of our human experiences are temporally embedded – they occur amongst a progression of experiences with no (reliable) start or end. Additionally, many of our personalised experiences have (or seem to have) temporal extension. Temporal qualities of experience are intrinsic to human consciousness.

Phenomenology, taken as a method of philosophical (or scientific, according to some) enquiry need not be restricted to a static image, nor to images produced in a certain way.

“The expression ‘phenomenology’ signifies primarily a concept of method. It does not characterize the ‘what’ of the objects of philosophical research in terms of their content but the ‘how’ of such research.” (Heidegger, 1996)

As a method for enquiry, phenomenology is equally suitable to considerations of animation as of painting, as long (Parry and Wrathall might argue) as an argument can be made that the medium of the material under consideration is ‘commensurable’ to the lived experience; there must be a logic behind the use of a given artefact as a vehicle for access to a direct experience of the world. In this research, animation is claimed as a ‘commensurate medium’ for the capture of internal
image impulses. The medium specific qualities of animation, being that it can manifest all manner of images and display a specific quality of image mobility – metamorphosis – is a central contention to the phenomenological approach to this research.

In the case of this research, the creative works give access to the internal states and inclinations of the practitioner, as well as conveying information about the interaction of these states with the materiality of the digital processes used. This is achieved not by creating artefacts that deliberately hold encoded meaning (though there is often some figural content, as well as the meanings potentially encoded in rhythm, abstract motion and other formal aspects), but artefacts that can be experienced directly as moving and existing forms, free from reflective analysis. For the viewer, they are forms that ‘behave’ in a manner that provides insight. The behaviour exhibited is one unique to the medium of animation, and this research ultimately proposes this is behaviour that is shared by the mind. In this way, the animation provided is perceived in a manner that both reflects its production – shared viewpoints, an evolution of emergent forms in the same sequence as they were conceived, and a morphology of form that travels from one shape or concept to the next fluidly and with a material movement that conveys primarily a sense of this fluidity as a medium.

One of the primary roles of this written dissertation is to establish the case for the validity of the artefacts submitted as being able to fulfil this role as commensurate windows of perceptual access to the processes of their improvised production. In this argument for being a suitable medium (after Parry and Wrathall) for sharing specific attributes of the nature of thought, I describe similarities between metamorphic animation and the functioning of the ‘stream of thought’, and explore the operation of these similarities from the perspective of the practitioner and the audience.

This involves inviting the audience not only into their own perceptual experience with the works presented, but further offering these works as a record of a process of interoception and material improvisation – a personalised internal process for the practitioner. Recalling Frederick Franck’s description of a drawing as a fossil record of practice and experience, but one “that at any time can be resurrected by any eye that is sufficiently awake to follow the lines as process” (Franck, 1973), the animated works give a shared access to the interior process of their improvised making. As such, a particular type of phenomenology is called for.
3.6.2 HETEROPHENOMENOLOGY AND ACCESS TO INTERNAL STATES

If it is the case that images can embody representations of thought, how might we consider the process of both encoding these spontaneous thoughts and perceptions through practice and subsequent decoding through vision and perception? A methodology is required that gives reasonable presumption of access to the phenomenal experience of another – in the case of this research, a methodology that can explain how an audience of animated artworks may achieve access not to the external world, but to the experiences of practice.

The 'first person plural presumption' (Dennett, 1991) or what philosophy calls the ‘problem of other minds’ (Hyslop, 2016) refers to the idea that there is no reliable or logical way we can suppose that the internal states and the qualitative phenomenal experiences of others are the same as our own. Our primary access to the thoughts of others is provided by observations of their outward behaviour; these behaviours serve as an indication of subjective internal experiences. The process of inference of internal states is controversial, but philosopher Frank Jackson points out that the basic premise that we can, and do infer the internal states of others based on observed external behaviours, is not (Jackson, 1982).xiii This presents a methodological challenge, as I offer that the improvised works submitted are a genuine reflection of internal experiences. Malcom MacCullough states that part of Searle’s assertion that the ontology of the mental is non-objective, is a claim that "intent is an undeniable component of behaviour, but that you cannot detect intent in a detached experimental setting" (MacCullough, 1998). This calls for a connection between the internal, non-observable and the formation, or recording of these internal processes into an externally observable form.

Other than observation of external behaviour and scientific study of available physical brain and body data, we can only rely on 1st person reports of internal subjective experience. Daniel Dennett claims that since introspection can never be objective, we can only practically take reports of introspection as texts, acknowledge them as subjective, and yet grant them the status of texts that convey the full intent of their author - as though they were fully accurate, if not strictly ‘true’ (Newman, n.d.). This method of working with self-reports as text is referred to by Dennett as heterophenomenology - the phenomenology of studying the internal perceptions of another (Dennett, 2003). This is initially a methodological explanation used by Dennett in the field of consciousness studiesxiv. In this research project, it is adopted from that field, supported by the initial notion of phenomenology as a method of investigating what Polanyi described as interiorised – or tacit – knowledge in the area of animation practice and production. When the audience apprehends the works produced, they themselves are entering into a phenomenological
arrangement whereby they may experience the process of improvisation by which the works were produced.

Dennett has explained heterophenomenology as a bridge, capable of connecting studies of consciousness in the natural sciences with the subjective nature of human experience (Dennett, 2007), pointing out that this methodology is really just a formulation and formalisation of a range of psychological approaches to studying consciousness and the mind:

“...heterophenomenology is nothing new; it is nothing other than the method that has been used by psychophysicists, cognitive psychologists, clinical neuropsychologists, and just about everybody who has ever purported to study human consciousness in a serious, scientific way.” (Dennett, 2003)

Typically, the ‘texts’ of heterophenomenology referred to above in a heterophenomenological approach are verbal reports and responses by a subject to questions from researchers about the nature of their internal experience. In this dissertation, the principle of heterophenomenology is applied to artworks, made as a visual record of spontaneously arising thoughts, mediated by interaction with digital tools and materials. The animated works are then offered as texts that offer the viewer the possibility of ‘directly perceiving’ (to use the terminology of phenomenology) not the external world, but a process of interoception (internal perception).

Of course there is a very wide array of artworks which may be said to be representations of the artist's 'internal experiences' that would not necessarily be useful for a process of heterophenomenology. The animated works included as knowledge embodying artefacts in this research were produced specifically for this purpose and under fairly rigorous conditions. These conditions support the claim of their status as a 'text' of internal experience.

In summary, the primary methodology for this research is practice led research, with the guiding model for the integration of practice and other research activities being the iterative cyclic web. As the inquiry into the process of improvisation in digital sculpture and animation is the central unifying and guiding motivation, the iterative cyclic web funnels the research activities towards research-led practice. This research led practice is understood through phenomenology, which provides a context through which to understand both the activity of the improvisation phase of the animation practice, as well as a model for understanding the artefacts produced as knowledge embodying instruments. These submitted artworks then, serve as heterophenomenological texts of practice experience.
The specific methods for the research can be summarised as improvisation, digital sculpture and animation. These methods are explained with detailed reflections in the next section.
4. **PLASMATIC – IMPROVISING DIGITAL SCULPTURE**

“As computers become faster, and interfaces improve, more processes become operable by continuous strokes instead of discrete selections. This switch from discrete to continuous distinguishes digital craft from mere mechanical machine operation.”

(MacCullough, 1998)
This section provides a detailed overview of the practice and discussion on the artefacts presented in order to contextualise and describe the findings therein. Additionally, these reflections provide a reference for following sections that will expand the theoretical discussion of the research and findings.

As stated in section 1.1, the initial motivation for the practice on which this research is based was recognition that many forms of appealing, expressive and exuberant animation seemed to be incompatible with contemporary, digital toolsets. Particularly in the areas collectively known as ‘experimental’ animation, there appeared to be a gap between experimental animation in analogue media and digital media. In the films of Len Lye, Norman McLaren, Edgardo Berjman and a host of others who largely produce(d) straight ahead animation, there seems to be an abundance of expression, tactility and exuberance, where in the (incredibly broad) range of types of digital experimental animation, there seems to me to be moves towards generative art, code and signal driven abstraction and an increasing distance between the artist and their tools. This is by no means a universal condition, but an observed impression. Personally, I was very much in love with the digital tools that facilitated the production of highly detailed and complex 3D animation. But the procedures required seemed very programmatic, and formulaic. Failure to properly execute one step in the planned workflow would cause a ripple of inexactitude and error through the work that, while potentially creating beautiful images, did not feel like the any sort of mark of spontaneous thought.

Films like Len Lye’s *Free Radicals* (Lye, 1958) always struck me as a strong antithesis to a considered and carefully drafted and drawn industrial style animation. And central to Lye’s descriptions of his approach to direct film animation were musings on the mental attitudes involved in its making. Lye described attempts to access a pre-rational, or pre-cognitive aspect of mind, utilising deep intuition, discarding the ‘known’ and entering into a process of “communicating with yourself about significances” (Scott, 2001). These approaches did not seem to accord with approaches to 3D animation that required rational, logical steps and sequences to create pre-conceived images.

The initial motivations for this project extended from a certain constellation of emotions relating to animation production. Among these motivations was a sense of frustration at the extended production times involved in most forms of animation. It seemed that aside from the most abstract types of animated image, a huge amount of intense and careful procedures were required for each brief sequence of animation produced, and potentially endless layers of tweaks and refinements may be called for to achieve the desired appearance of basic motions. This
orientation to practice is significantly different from the approach described by Lye and as evident in the work of some experimental animators. It is a difference based in the types of internal decision and action systems relied on. Neuroscientist David Eagleman describes that within the mind and mental process, there is a type of ‘rivalry’ between rational and emotional systems. On one hand, the rational system is described as slow, cognitive, systematic, explicit, analytic and rule based, in contrast with the emotional, reptilian or limbic system is described as fast, automatic, implicit, heuristic, intuitive, holistic, reactive and impulsive (Eagleman, 2012). When Len Lye describes the evolution of his intuitive approach to animation practice, he describes an instinctive selection of one of these mental modes over the other “everything I did, everything that happened to me, was all conducive to adding to my Old Brain capacity. And I went with it. I didn’t fight it” (Lye & Curnow, 1980).

As outlined in the previous section, the creative works produced for this research are intended to serve as a window into the experience of their creation. As heterophenomenological objects, they provide a platform of intersubjectivity between the audience and the practitioner. Like many art forms, they are a means by which one consciousness acts on another. According to Elliot Eisner, there are three key phases involved in the function of art as a transformer of consciousness:

“inscription” where an experience is preserved in some durable form;

“editing”, where the inscription is arranged to achieve a certain standard of quality or precision; and

“communication”, the necessary transmission of consciousness into the public whereby the work can interact with culture and perform its final function (Eisner, 2002).

As a means of capturing and communicating the results of this research, the production of the creative works submitted for consideration has also proceeded in three key stages that mirror the 3 stages described above, though with some qualifications that arise from the nature of the improvisational process.

The ‘inscription’ phase is a process of improvised digital sculpture. The ‘editing’ phase is the process of preparing the sculpted forms into a timeline and assembling them to be rendered as a finished video clip. The communication phase has been conducted through a series of exhibitions of the three primary works in the series. These three phases are described in detail in this section.
A range of experiments were conducted in other media, including animated and static artworks that informed the development of the digital sculpture workflow described here, and description of these experiments can be found in appendix 2, (section 9.1).

4.1 A NEW WORKFLOW FOR ANIMATED DIGITAL SCULPTURE AND METAMORPHOSIS

Provided here as a reference for the following discussion, this workflow and technique forms part of the outcomes of the research project.

- Preparation of the base mesh
  - Create a cube object
  - Subdivide the cube a number of times to produce the base mesh object known as a ‘squirkle’.

- Entering a receptive state, allowing image impressions to enter the mind
- When a mental image asserts itself, this image or form is sculpted onto the digital mesh
  - Using the digital sculpture tools, and hardware interface device, manipulate the surface of the object until the imagined form is represented
  - This is largely done from a singular viewpoint
  - Record the model state by storing the vertex position data

- Wandering across the surface of the model
  - Orbit the recoded model in an exploratory way, while simultaneously re-entering the receptive state of daydreaming or mind wandering
  - When a new mental image asserts itself as a combination of the on-screen view of the model in its new position and spontaneous mental imagery, repeat the sculpting and recording phases, then repeat the wandering phase

- Sequencing of the sculpted models in 3D animation software
  - Import the recorded vertex position data models into 3D animation software
  - Assign each of these models as a new ‘morph target’
  - Allocate positions on the timeline at which each morph target is expressed
  - For each of these expressed model states, rotate the model such that the view to the camera matches the original view from which the particular model state was sculpted.

- Lighting and rendering
  - Light the model
  - Render the timeline to a video file
Exhibition

- The rendered video file is projected onto an exhibition surface such that the black background is not visible and the model appears on the surface without any frame

4.2 PREPARING THE DIGITAL MESH – SEEKING HARMONIOUS EQUIPOTENTIAL

The process of creating the plasmatic works and other trials and examples arising from the development of the new workflow begins with a nondescript ‘blob’. The blob is not ‘formless’ – by its digital nature it is precisely defined. But rather than beginning with a void, to which polygons are added (as might be the case in a regular 3D modelling process), there is an existing entity onto which the following shapes are expressed. This starting point, which opens not with a vacuum or empty space, but with an existing entity may echo the existentialist notion that we always find ourselves ‘always already’ involved in an embodied, situated relationship with the world. Martin Heidegger in particular notes that Dasein always arrives into a world that has some familiarity (Wheeler, 2015). In this case, it would be the apparent properties of the object on screen – light falls from above, implying mass and veridicality. The movement of the orbiting 1st person camera, showing that there is a familiar physics to the scene, and so on.

This ‘defined blob’ must have a particular structure to allow maximum freedom when sculpting forms – as a preparatory phase, occurring before the improvisation phase, this is a carefully controlled process. During the experiment phase, a number of different blob types were trialled, and it was found that the most conducive to the improvisational sculpture process was a mesh entity with the most even distribution of polygon density and constituted by an object where the number of edges that meet at the vertices was most consistent. This is slightly technical, but is important because here the first links emerge between the improvisational process and theoretical understanding of animated metamorphosis.
Consider the following mesh object as a potential starting point for 3D sculpture:

![Figure 15. A ‘standard primitive’ sphere, available in 3Ds Max (Autodesk, 2015).](image)

The geometry of a standard primitive sphere uses four sided polygons for all but the polar ring of polygons which use three sided polygons. Figure 15 shows that when the number of polygons is increased in order to give the sphere potential for more detail, the pole of the sphere remains, but the number of polygons attaching to that pole increases.

Where more than four edges meet, this is known as an ‘extraordinary vertex’ and the term ‘valence’ is used to indicate how many edges are meeting at that vertex. (Stam, n.d.). In Figure 15, the polar vertexes of the 3D mesh sphere are examples of extraordinary vertexes.

A range of other geometry types was tested, and it was deduced that the solution to this is to use a polyhedron sometimes called a quad-sphere, a UV sphere or colloquially a ‘squirkle’. As this term implies, the squirkle is a cross between a square and a circle – or in this case, a cube and a sphere. Very simply put, this is a polyhedron that starts as a cube with six square four sided polygonal faces and then through applying Catmull-Clark subdivisions, this cube is smoothed until it becomes (almost, but usually not quite) spherical.
Figure 16. A squirkle, created by subdividing a cube.

The quad-sphere ‘squirkle’ consists of only four sided polygons and no extraordinary vertexes. Both in appearance and in behaviour, this form provides the ideal starting point for improvised sculpture (though with a much greater mesh density than is shown here). Despite need during the sculpture process for the mesh to be co-operative and responsive, this process is an attempt to render the starting mesh as ‘neutral’ as possible at the outset of the sculpting process. The squirkle is not offered as a built-in polyhedron in either the modelling and animation software or the digital sculpture software used in this research, but can be easily created by first creating a cube object with one polygon per side, and then subdividing the mesh which smooths the vertices into a nearly spherical shape.

As well as even distribution of polygons, vertex and vertex valences, the number of polygons on the object is also increased to the maximum that the system can reasonably display, sculpt and render. This again inverts the traditional principle in 3D object design which is to minimise polygons where possible (through a range of techniques including image mapping) to reduce animating and rendering times. The higher number of polygons creates more possibilities for areas of detail, especially since the polygons will be rearranged and moved around the model in ways that are not predicted in advance.

I adopt the term ‘harmonious equipotential’ to describe this arrangement of a high number of evenly distributed regular polygons and evenly valanced, non-extraordinary vertices. This term originally comes from Hans Driesch, a late 19th century naturalist philosopher who espoused what
he called the “Machine Theory of life” (Sander & Counce, 1997), and is used to describe “embryonic organs or even animals” wherein each part of the organ or animal, even if separated, has the possibility of developing into a whole, with all the elements possessing the same “morphogenetic ‘potency’” (Driesch, 1891, cited in Gordon, 1999). To describe the base mesh as a system of harmonious equipotential is not to adopt Driesch’s philosophical machine theory of life which involves a now discredited biological argument for vitalism (Sander & Counce, 1997) although, as an animator there is always a sense of ‘vitalism’ in the craft. When we experiment with animation, we experiment with the very act of giving life to the inanimate. But further, as a starting point for metamorphic animation, which Sobchack has described as “liberating in its democratic lack of hierarchical attachment to any privileged form of being” (2000), a system of harmonious equipotential establishes this non-hierarchical, evenly featured starting structure as intrinsically connected to the practice of creating improvised digital animated metamorphosis. Any deviation from the equality of potential in the digital structure, ultimately privileges a future form by creating a bias in the behaviour of the digital mesh. An example of this is discussed in the following section.

Inevitably, the mesh becomes concentrated and re-distributed throughout the sculpting iterations and this neutrality dissolves into the compounding of improvised shapes that in turn influence subsequent sculpting. But in resolving the ideal starting point for an improvised 3D sculpture session of this type, we can say that it should have a dense and numerous polygon structure that exhibits harmonious equipotentialxx.

4.3 ENTERING A RECEPTIVE STATE FOR IMPROVISATION

Once the base mesh is established (which despite the extended description here takes very little time, or thought in practice), the next step is to enter into a receptive state within which a mental image may arise. This is not mystical, or trancelike. It is simply a mode of lifting careful conscious attention and intention from any external task and allowing a type of simple and natural thought wandering to take over. This state or process is analogous to a great many descriptions of unconscious or spontaneous thought, or to daydreaming. What they hold in common is a volitional decoupling of attention, a concept perhaps best summarised by Jerome L. Singer, pioneer of theories of daydreaming and mind wandering, who stated

“Our human condition is such that we are forever in the situation of deciding how much attention to give to self-generated thought and how much to
information from the external social or physical environment” (Singer, 1993, cited in McMillan, Kaufman, & Singer, 2013).

In this case, the decision is to attempt initially to give as much attention as possible to self-generated thought. But this situation goes a little further, because it is not simply the directing of attention that changes, but it seems to be the entering of a certain state of being. According to Gelernter’s ‘cognitive spectrum’ theory, the state of the thinker is directly related to the type of thought that is available (Gelernter, 1994). Peak alertness and directed focal attention makes thinking precise, calculating and penetrating, while more relaxed states of low focus can constitute a condition whereby thoughts may seem to come “completely out of thin air” and “each thought may seem to bear no relation to the previous” (Gelernter, 1994). At this lower state, emotions have a greater influence on the subconscious and thinking is more intuitive, reactive and instinctive.

With regard to Gelernter’s cognitive spectrum, it is the state of receptive relaxation that creates the optimal conditions for visual improvisation. A relaxation of analytical focus, and deprioritising of deliberate action and procedure.

Improvisation is a specific type of exploratory cognitive activity. The argument in this section takes the position that the tools and materials of improvisation are an integrated part of our cognitive process when making. This is an argument for extended or distributed cognition. Additionally, I extend the argument that improvisation is a state of practice, and one that can be governed, but that this governance is not independent of our technologies. I am arguing against artists and their artworks becoming products of our technologies, and identifying this as a negative risk in improvisational practices that include software as part of a process of distributed cognition.

The improvised is the unforeseen or unplanned. The etymology of the verb ‘to improvise’ comes from the Latin roots ‘im - provisus’; the particle im, a negative, or negating prefix, and the verb provisus, meaning to foresee or make provision for (Douglas, 2012). The term in use has not deviated significantly despite the wide range of practices that improvisation may be applied to. Improvisation is fundamentally an exploration of the unplanned, or unforeseen.

Improvisation, being ‘without prior provision’ may seem at first to be a very accessible type of practice, because there may be a mistaken impression that the improviser need not be ‘prepared’. However, improvisation requires both that the performer or artist be able to enter an appropriate mental state or orientation to the work process, as well as relying on considerable mastery of the discipline in which the artist is improvising, usually involving significant training.
Consider the improvisational practices of a jazz musician – it is necessary for a high degree of competence with the instrument and standard music forms before improvisation is possible. Though the process of improvisation is spontaneous and unplanned, not so the preparation for improvisation.

To take the broadest view on improvisational behaviour, improvisation can be described as a basic mode of interaction in the world. In our everyday lives, improvisation is a description of the types of behaviours involved in our interactions with well-known scenarios – our frame of cognition when dealing with well stocked and established world schemata. The automatic processes required to be available for improvisation are acquired through familiarity with the scenario in which improvisation will take place. This familiarity is an epistemological state for the subject that facilitates activity, or as Wallace & Press state, “Intuition is about knowingness, a sense, a form of navigation within the process of craft” (2004).

Aaron Berkowitz and Leo Treitler agree that “the rapid real-time thought and action” involved in improvised performance rely on the knowledge base and procedural skill of the performer being adequately internalised and automatized” (Berkowitz, 2010). Berkowitz found that in executing an improvised performance, practitioners draw both on consciously developed knowledge and skills, as well as drawing on unconsciously acquired abilities (ibid) – skills and abilities that the artist may not know they possess, echoing Polanyi’s assertion that we can know more than we can say (Polanyi, 2009). Improvisation then, involves an interaction of internal knowledge and skills that are both conscious and unconscious. Successful engagement with an improvisational process relies on the ability of the artist to enter an appropriate state for accessing the unconscious knowledge of their craft. In the case of this research practice, it also involves interaction between elements of behaviour that are both internal and external to the practitioner.

4.4 IMPROVISING WITH DIGITAL MATERIALITY AND DIGITAL CRAFT

Externally, improvisation has a material dimension, requiring the improviser to utilise the materials and sources available without previous planning. Mary Cossan refers to the idea that “the environment will teach you if you let it” (Crossan, 1998), implying that improvisation requires the practitioner to adopt a state that is receptive to external conditions and elements. This environmental awareness applies to all aspects of improvisational practice, but in the case of digital art production, the environment most relevant is the digital production environment, including both hardware and software elements.
Part of this material dimension is that the improviser must have a sense of material empathy, or an attunement to the materials they are working with. The craftsperson involved in improvisation is an interpreter, expressing not simply the properties of materials, but in fact a range of subjective qualities of materials (Pye cited in Wallace, 2010). This distinction is particularly important in digital practice as the nature of the digital medium is so readily specifiable as properties. All properties are defined, ultimately by specific numerical data. But these properties still have a broad range of subjective qualities and arrangements, and these qualities do not lend themselves to such specification. The digital craftsperson or artist is still relating the qualities of a human interaction with the digital materials, and to the personalised experiences these interactions give rise to.

So in the case of the Plasmatic works, in addition to the digital environment in which the production takes place (the toolset), it was necessary to consider and to develop an empathy towards, and intimate knowledge of a set of digital ‘materials’ in order to achieve an effective improvisational practice. In a design process, materials are often selected for their functional and aesthetic value (Lefteri, 2012), as well as potentially for their symbolic, or semiotic value (Jung, Blevis, & Stolterman, 2010). Just like physical materials the virtual materials I am concerned with in the production of these works can have subjective qualities and behaviours to which the practitioner can become attuned and responsive. The improvisation process used in this research is not one of a will imposed on a material, but a sympathetic and responsive process where the practitioner, artist or craftsperson as well as the material are engaged in an interactive and emergent process of defining forms and images.

When an initial instinct towards a particular form arrives, the first sculpture process begins. The tools provided by the 3D sculpture software allow the user to push, pull, build, scrape and otherwise treat the surface of the digital mesh as though it were a physical surface. However, in this project, only a limited set of tools were used, in order to avoid shifting into an analytical state of consideration of which tool might be best to most efficiently manipulate the mesh into the form in mind. This maintains an orientation to the mesh object, rather than an orientation to the software. This is important, as, under Gelernter’s cognitive spectrum model, conscious operation of the specifics of the software may move the mode of thinking ‘upwards’, or towards a more precise and analytical mode of thinking.
Discussions on technology and tool interactions obviously precede the digital era. Humankind has been referred to as ‘Homo-Faber’: man the maker. Henri Bergson defined this aspect of intelligence as the "faculty to create artificial objects, in particular tools, to make tools, and to indefinitely variate its makings" (Bergson, 1998). But as we make tools, so may they in turn make us.

Martin Heidegger’s existential phenomenology sits within the lineage of theory and philosophy which sees human existence and experience as both physically embodied in its settings and also as culturally embodied. In his most famous work – Sein und Zeit (Being and Time) – Heidegger proposes the term ‘Dasein’, often translated as ‘being-in-the-world’ as the particular mode of being which is experienced by humans (Heidegger, 1996). This approach to the concept of being does not see the human in isolation, but considers the human experience as cast against a practical and cultural background, including tacit skills, implicit beliefs and patterns of behaviour (Walters & Kop, 2009). Our actions as embodied beings illuminate our natures, but equally reveal the way in which we see the world and the external factors which shape our behaviours. We must contend with the reality that the cultural ground and context for our being is constantly changing, and that we as embodied beings change with it.

Artists working with digital tools must consider how these tools and their cultures of use influence states of being conducive to artistic practices. In The Question Concerning Technology, Heidegger links instrumentality, or a means-to-end approach to the presumptive use of technology;

“This instrumental way of thinking stems from our assumptions about causality. If we come to understand modes of causality as ways of being responsible for the arrival of things into existence, we can begin to understand that the essence of technology has to do with the way we are oriented to the coming-into-existence, or the "revealing" of the world.” (Heidegger, 1954)

It is our orientation to technology which is important, rather than some feature of technology itself, as it is this orientation which governs how we see creation, or revelation. For the artist interested in creating or revealing something of the world, this orientation to the technologies of their craft is critical, as it is through these technologies that they see and experience the worlds of their creation.

For artists, the digital age presents new opportunities and challenges in regards to our orientation to technology. In The Origin of the Work of Art, Heidegger proposes that the essence of art is not
fundamentally about the manufacture of artworks, but rather the art process is an experience which is itself a mode of revealing truth (Bolt, 2004). The particular type of truth involved here is *aletheia*, or ‘truth-in-unconcealedness’ (Heidegger, 1971). That is, that the true essences of things in the world are concealed, and that *aletheia* is a revealing which ‘un-conceals’ true essences.

Heidegger’s concept of ‘*gestell*,’ or ‘enframing’ from The Question Concerning Technology proposes that modern technology’s method of revealing reality is that unlike *aletheia*, technology reveals the functional potential of things and defines them according to their potential as resources. Where technology is defined as the production of interventions providing ‘means’ to ‘ends’, the ends, and ultimately the entire world become defined through the available technologies, reflected by Abraham Maslow’s famous ‘law of the instrument’: “I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail” (Maslow, 2004). It is this instrumental view of technology which Heidegger suggests is avoidable, and may allow craftspeople and artists to be free of the enframing nature of modern technology.

Heidegger sees pre-modern artisanship as being *poiesis* rather than *techne* in large part due to the different orientation to the technology and interaction with the materials involved in the processes. Describing the orientation of an apprentice cabinetmaker, he writes:

“If he is to become a true cabinetmaker, he makes himself answer and respond above all to the different kinds of wood and to the shapes slumbering within wood—to wood as it enters into man’s dwelling with all the hidden riches of its essence. In fact, this relatedness to wood is what maintains the whole craft. Without that relatedness, the craft will never be anything but empty busywork, any occupation with it will be determined exclusively by business concerns. Every handicraft, all human dealings, are constantly in that danger.” (Heidegger, 1954)

What, if any, are the relations between this cabinetmaker and the user of digital software? We utilise these digital tools to manufacture virtual versions of the world (and of the imagined world). In interacting with the virtual materials of our craft in analogous ways to that of the cabinetmaker, how might a virtual material communicate the ‘hidden riches of its essence’, or do such riches exist? Is there a similar opportunity to respond through technology to the properties of the mesh arrangement much as a cabinetmaker may respond to the variations in the grain of a piece of timber?xxi

The tool used to interact with the software is a digital drawing tablet and stylus. This is a pressure sensitive device that allows a greater effect on the surface of the model by pressing more firmly
on the active surface of the device. The sculpture software used for the creation of the models in the *Plasmatic* series is ZBrush\textsuperscript{xxii} (*Zbrush*, n.d.). In the sculpting process, the ‘standard’ tool is used almost exclusively, with a ‘hotkey’ modifier that switches the tool to subtract, rather than add volume to the mesh by moving the vertexes towards the central origin point of the object, rather than away. Additionally, there is another hotkey modifier that causes the contact point to have a smoothing effect on the surface of mesh. Finally, there is a hotkey for changing the size of the brush. This limited set of tools limits the need for making selections from the interface or list menus. This prevents the intrusion of linguistic, or software focussed modes of thought during the process of translating the visual thought into form.

This combination of the stylus device, the visual interface of the software, and the limited selection of the tools allows a tactile, or physical connection between the mind, eye and hand, with minimal (though not completely free of) interference from language, program procedure or prescribed order of operations. In this way, the practitioner is able to develop what Malcolm MacCullough, who wrote the highly relevant *Abstracting Craft* (1998) describes as a contextual awareness based on a subconscious background of required actions\textsuperscript{xxiii}. MacCullough, citing Focillon points out that in relation to crafting, hands have an exploratory life of their own, a position that he summarises as a pure phenomenology of “sensate presence” (ibid).

This phenomenological sensate presence is in contrast to a cognitive presence. The concept of a sensate presence builds almost directly on the concept of the ‘virtual body’, described by Merleau-Ponty. The virtual body is the inclusion of tools and instruments into an extended sense of self. Addressed in the *Phenomenology of Perception* Merleau-Ponty described that “the body adapts and in effect, extends itself through external instruments” (2012). This is not an uncommon phenomenon. We sense the width of a car we are driving (the classic example, though Merleau-Ponty offers the dated example of a woman being carefully aware of the height of a feather in her hat). Don Ihde extends this discourse on relations between individuals and technologies by claiming a special status for those technologies that can become part of our interactions with the world without becoming themselves objects of our conscious perception and attention, labelling these as ‘embodiment relations’ (Ihde, 1979, 1990, cited in Brey, 2000). These objects include telescopes and eye glasses (which naturally ‘withdraw’ from our attention according to Brey), as well as dentist’s tools, which augment the sense of touch, but less so hammers, or other tools which are primarily designed to act upon the world, more so than to provide sensory feedback. These objects sit between, and mediate the interaction of the body, (or ‘body schema’, in Merleau Ponty’s terms, a subjective, spatialized sense of the physical body) and the world or environment.
Brey argues that there is an important distinction between objects that mediate our perceptual experiences and those that provide motor, or physical interactions with the world. Taken collectively, complex digital systems, including the display and the digital stylus used in the production of the *Plasmatic* works create an interesting hybrid of both perceptual and motor engagement. The design of the stylus clearly aims to leverage prior experience, tacit knowledge and human bodily attributes (such as manual dexterity) to shift otherwise complex tasks to the autonomic level of action. The pen in hand becomes a natural extension. But there is no useful haptic or tactile feedback during the sculpting process. There is however visual feedback, via a digital display which in the case of this work is separated from the drawing surface. The drawing tablet is a tool for interactive motor engagement with the virtual world space, becoming integrated into the body schema through an embodiment relation. I suggest that the display is also in an embodiment relation, providing perceptual access to the virtual sculpture space of the digital system. The situation is further complicated by the translation of the two-dimensional drawing space into the three-dimensional sculpture space. In this case, as we zoom, and rotate this virtual space, these actions become automatic – the combination of a hotkey and a motion on the drawing surface becomes how it ‘feels’ to zoom, or to rotate. The ability to navigate the virtual in this way transforms the space, its apparent Euclidian presentation gives way to the personal and subjectively mediated screen – one can change perspective, shift between micro and macro view and rotate at different speeds with ease, creating a unique circumstance between Merleau-Ponty’s spatialized body schema and virtual space. This unique ability of virtual space and digital software is rich with possibility.

Ultimately, MacCullough questions the ability of software to become sufficiently intuitive to “allow the full spectrum of abilities and imagination” (1998). In such broad terms, it is difficult to disagree, but the process described, working with tools that have become available since that view was expressed is an attempt to do just this – to minimise the interaction with the software and focus instead, as directly as possible on an emergent interaction with the digital mesh object itself. MacCullough does predict the useful progress that these new interfaces currently provide, indicating that:

“As computers become faster, and interfaces improve, more processes become operable by continuous strokes instead of discrete selections. This switch from discrete to continuous distinguishes digital craft from mere mechanical machine operation.” (ibid)
These new tools thereby become central in the opportunity to respond to arising visual impulses in an improvisational way – in the form of craft rather than as a part of the technical rationalist ‘mechanical machine operation’. As attention shifts from the software interface to the virtual material, the awareness is oriented to the surface, not to the mesh and to the material, not the object as such. This reflects a critical transition from object to process.

In *Software, Animation and the Moving Image: What's in the Box?* (2015) Aylish Wood adopts Ian Bogost’s term “procedural rhetoric” (Bogost, 2010) to describe the set of operations by which instructions are given to a computational system. The inputs are generated from a graphic user interface (GUI) that usually offers some sort of visual metaphor; for example, files in folders, paperclips and envelopes are some of the metaphors used for office related activities. 3D animation software presents the metaphor of Euclidian space with the dimensions labelled $x, y, z$, where the user can manipulate the 3D models. The metaphor of real space in the interface, is an extensional part of this procedural rhetoric offering “seemingly direct interaction with objects and entities with which they are working”, serving to focus the computer interaction on the artistry of the animator, rather than on the computation (Wood, 2015). This interface design intentionally shifts the focus of the user from a computational orientation to a visual and artistic one.

Wood explains that when other tools and ‘persuasive processes’ are visible on screen that do not follow the same visual metaphor of the interactive Euclidian space (such as list menus, and tools that contain instructions and numerical values) there is a tension created between creativity and automation - the foregrounding of the artistic interaction is diminished by awareness of the software’s function and ultimately of its mediation of the creative input (ibid). This tension of course falls on the animator. It impacting the balance between their engaged enjoyment, creativity, productivity and precision. *Zbrush* offers many of the same modeling functions and operations as other 3D modeling software, but as it relies much more heavily on the use of a tablet and stylus input, it can reduce the use of abstract instructions in favour of (at least the appearance of) direct pointing at the surface of the object being created. In the sculpting phase, this project did not require the use of many abstract tools or processes other than the visual metaphor of the blob of clay and sculpting tools. By sequestering this creative sculpting phase to a software platform that takes this approach and by designing the workflow in such a way as to avoid the potential rhetorical tensions in the interface, focus can remain on the production of the forms.

When the deeper operational logic of the software is more apparent (for example when inputting numerical values for transformations or effects) and the world-space metaphor of the software...
interactions are less dominant, software can more readily shape the way that the artist learns about the computational behaviour of the system. When using the more direct interactions that are available through the visual metaphor of space, object and tool, the work can proceed without conscious consideration of the processes, and ideally without this pedagogical entanglement that Wood identifies\textsuperscript{xxv}, which could be considered another example of Heidegger’s ‘enframing’.

In reviewing the outcomes of this digital sculpture practice, there are some thematic tendencies among the shapes that arise. In many cases, these impulses have been body parts; faces, skulls, feet and fingers all feature prominently. Evaluation of these types of forms will not be conducted as part of this research, though it seems possible, indeed irresistible that the forms that emerge spontaneously are often linked to other life events and preoccupations occurring at the time of making. For example, in one experiment, there is imagery of an animating spine, relevant at the time as I was suffering chronic back pain; in another, a moustache perhaps inspired by my ex-father-in-law as shown in Figure 17, below.

![Figure 17: Three unplanned sculptures, showing an exaggerated moustache perhaps inspired by my ex-father-in-law.](image)

There is a prevalence of body parts as shown in Figure 18. It is tempting to equate these forms – ears especially, but also hands, feet, torsos and facial elements – with the bodily imagery of Jan Svankmajer. It is possible that there may be some connection via process – Svankmajer’s clay based stop motion is often noted for its tactility, and the bodily imagery is related through this tactile (if grotesque) familiarity to an affect response driven by sensory modality, as described by
Vasseleu (2009). Animation clay, as used by Svankmajer, is noted for its particularly plasmatic potential (Frierson, 1994; Lepot, 2013).

Figure 18. These three models from Plasmatic No.2 show a range of body parts, perhaps evoking Jan Svankmajer.

Perhaps the digital clay offered by the sculpting software is effective enough as a virtual material that the familiarity of human form suggests itself even through interface of the software. Perhaps the familiar knowledge of form – in this case bodily, human form - that MacCullough noted is possessed by the hands, is expressed.

For an audience however, it is thought (and hoped) that while sometimes individually identifiable, these forms do not display enough narrative continuity to suggest that the visual experience relies on any specific understanding of meaning. This is appropriate as, phenomenologically, they present only a fleeting impression, rather than a propositional statement of any narrative consequence. Recall that these are intended to be facilitating texts of heterophenomenological experience, calling back to the process and time of their making.

During the process of sculpting the form, there is an interaction with the material and a response from the mesh based on the arrangement, layout and topology of the mesh that constitutes its shapes. Areas of higher density in the mesh hold more detail. In this ability and tendency to hold more detail, these areas become attractants for the inclusion of detail. This addition of features and details is not conscious or intentional in many cases, it is simply that some areas of the mesh create either encouraging or discouraging visual results. It is as though the tool finds the digital material to be more receptive to detail expression – like drawing with a sharpened pencil rather than a paintbrush, or building a sandcastle with wet sand rather than dry sand. It is a feeling that the mesh in a certain area is more receptive to receiving detail. It is like skating on a variable surface. In this process, there is a natural attraction to move towards areas that feel conducive to receiving the intended forms. The feeling is physical, yet it can’t be. In this case, the tactility and haptics of the interaction with the object is mental – the material qualities become integrated
with a mental and physical experience of crafting. This is one reason why the mesh must display harmonious equipotential – at least initially, or structurally.

Figure 19  A base mesh with high valency poles leads to an uncooperative mesh that is unresponsive to sculpting intentions.

In Figure 19, from an early animation test, the model is being carved based on a base mesh that has ‘poles’, as shown in Figure 15. Here, the high valency ‘poles’ have asserted themselves in the emergent form. A pinched, indented base and a barely controllable expressence of edges and polygons at the top of the form are suggestive of a fruit, but this was a frustrating and slow stage in the modelling process. Any sense of being fully engaged in the sculpting process was broken by the need to reassess the reasons for the mesh misbehaviour and testing different sculpting options that would return the mesh to a more co-operative state. In this situation, there is an imbalance in the relative conviction between the maker and the material, where co-operative engagement in the expressence of a negotiated form has broken down. The mesh is resolute, and rigid.

If areas with higher mesh density are more receptive to fine expression of detail, areas where there is less mesh density (often because previous models have distributed the mesh by stretching or moving it around) the mesh is more dynamically responsive to the effects of the pressure sensitive digital cursor. For example, a subtractive tool applied to the surface of the mesh will ‘remove’ more virtual material in areas of lower mesh density than in areas of higher
density. This is a sense like carving a piece of wood and discovering a section of softer wood that seems to attract further carving. The response in this case may be to apply less ‘pressure’ on these areas. There can be a change of sculpting pace and intensity as the mesh invites a more delicate touch. It can also seem like an invitation to express larger, more intense shapes – a more dramatically expressive moment of sculpture.

Examples of improvisation also exist in 3 dimensional art-forms such as traditional sculpture, including through the process of ‘direct carving’ where a sculptor carves forms (typically in natural materials such as wood or stone) without prior planning (Zilczer, 1981). These too are cases of material improvisation, with the material behaviour defining the emergent forms in participatory interaction with the sculptor, or as an included part of the mental processing ‘unit’. Where does the mind or will of the artist end and the material assert its influence?

From the view of embodied cognition, an approach to dealing with philosophy of mind and cognitive science popularised by Varela, Thompson and Rosch, it is necessary to consider the mind’s functions as a part of the ecosystem in which that mind is operating (Varela et al 1991). One useful term for this is ‘operational closure’, used to describe an ontological unit that is defined by the inclusion of all component parts required to complete a process (De Jaegher & Di Paolo, 2007). In this view, the material and its behaviour (as well as any tools used) would be included as part of the operational unit of the sculpture process, meaning that even though the material lies outside the human brain, it is still considered an integrated part of the operational unit in the process of sculpting. Indeed, even when there is a goal or plan in mind, the qualities of the materials being worked with cannot help but participate in the emergent result.
In Figure 20, the properties of the digital material based on the topology and layout of the underlying vertexes participate in the emergence of the shape of an elephant (augmented by human fingers) as it creates areas of resistance and areas of mobility. Note the bulge of the precursor to the trunk area – a part of the mesh that responded more willingly to an additive function, and hence grew larger, or towards the viewpoint. Gesture generates visual feedback from the material, which excites mental impulse, which inspires further gesture towards the model.

The material anthropologist Lambros Malafouris describes a somewhat analogous case whereby flints are carved, or chipped into useful tool shapes by our ancestral human relatives in a process known as flint ‘knapping’. The knapper can only craft the form of the flint in ways that the material informs the maker as being possible through an ongoing interactive process of knapping; “the intention of the knapper is constituted – at least partially – by the stone itself” (Malafouris, 2013). Echoing Searle’s position that the ontology of the mental is objective and the embodied cognition of Varela et al (above) Malafouris encourages that we “abandon the intracranial ontological boundaries of human cognition” (ibid). This suggestion literally attributes the mind attribute of ‘intention’ to a stone. The supposedly inanimate has become a collaborator in the improvisational process under the expanded mind model of cognition, an arrangement that we can refer to as ‘material agency’. The materials and tools are critical in outcomes. Recalling also Gelerntner’s cognitive spectrum theory, the selection of certain tools will re-enforce certain
possibilities for thought (1994) and hence these interactions with these tools and materials do not result from, or depend on mental states, but rather participate in constituting those states.

Once a sculpted, three-dimensional form emerges as a combination of the original internal image impulse and an improvised, interactive process described above engagement with the exciting ‘newness’ of this emerging form recedes. The mind wanders. This form is stored, or saved by capturing the vertex position data; a process usually known as recording ‘morph targets’ or ‘blend shapes’xxvi. This is a simple process, involving only a couple of clicks on a menu rollout.

4.5 WANDERING ACROSS THE SURFACE

Once the initial sculpture is considered to be adequately representative of the inciting image impulse, or when a new idea or impulse intrudes, the model is turned to a new aspect in order to begin sculpting the next model state.

The models are predominantly or entirely sculpted from one particular viewpoint – the models are presented to the camera in the finished animation from the position from which they were sculpted. Often, because the form had been created primarily or entirely from a specific point of view, the rotation of the model would reveal that the form was only coherent from that particular point of view, leading to some humorous, or surprising revelations about the structure that had been created. In one sense, this is the model reclaiming its three dimensionality, asserting its depth and complexity (or simplicity) behind the previously oriented surface. In this way, the sculpture makes claims on reality – the lighting within the sculpture software remains constant and the shadows fall and run across the topology of the model.

In the following example, the initial model is captured and then the model is rotated towards the viewpoint (the nose shape remains visible at the bottom of the model). The new angle of the model reveals an area of the sculpted surface that was unimportant to the previous form, but now arrives as a site that inspires new ideas and shapes that collide and combine with other mental intuitions.
I consider that this new phase is best characterised by a meditative ‘wandering’ across the surface of the model, a wandering process that involves returning to a receptive state – as the feature arrangements are released from their previous roles, so the digital material is released from being that previous form. This receptivity and contemplative, non-purposive activity re-enforces the broad position that this process is one of becoming. In his book, The Zen of Seeing (1973) Frederick Franck draws a distinction between ‘looking’ which always relates a perceptual or sensory experience to the self, and ‘seeing’ which involves a loosening of object labels and indicates a disintegration of the relationship between the perceived object and the self. The act of seeing (according to Franck) is a healing, or a suspension of the split between self and world, where objects cease to act as symbols of anything but themselves. This is (whether wittingly) a move towards a phenomenological appreciation of the process of creation, and describes well this moment of wandering across the surface of the digital model.

The rotation (or sometimes zooming in or out) reveals new aspects of the topology that are now released from their roles as defining features of the previous form. This is a shift in the logical structure of the sculpted form and its parts. The features of the surface are released from their visual roles as ‘nose’ or ‘foot’. In the example above, the ear (lower right) becomes part of a gas mask that is integrated into the face. This detachment of ‘physical’ component roles is actually a shift in the ontological role of the parts for the viewer, and is cognitively similar to a process that occurs when viewing multi-stable images. Multistability is the property of an image to be seen or understood in more than one arrangement; the classic example is that of the vase/face. Neuroscientist Semir Zeki explains that even in the case of images that can be seen, or
understood in more than one arrangement, we can only ever recognise one of these arrangements at any given moment, due to the limits of information that can be processes through the visual cortex and still emerge in a way that contributes to a sensible understanding of the image (Semir Zeki, 2004). This means in effect that there is a moment where the image ‘switches’ from one arrangement to another. This is the moment that is sought during this phase of exploration across the surface of the model, or reorientation to its form. Again, the opportunity that supports this switching relates to the state of the practitioner during this phase. In his very popular book *Flow: The Psychology of Optimal Experience* (2009), Mihaly Csikszentmihalyi uses the term ‘attentional fluidity’ to describe the ability, or trait of attention switching and response to new stimuli. In these terms, this moment of receptivity to emerging forms, and a willingness for the perceptual switch (described by Zeki) to occur is an opening, or loosening of attentional fluidity in order to accept new forms.

Although released from assigned representational roles, there is a period of crossover where the previous incarnation of the form either informs the possibilities of new shapes emerging, or it is supplanted completely by new forms that assert themselves – cognitively, visually and conceptually. The new form arriving in consciousness during the wandering period is central to this process and my understanding of it as encapsulating a theoretical and visual analogy to the changing of thoughts during a ‘stream of thought’ in William James’ terminology and critical in linking this cognitive process to theories regarding metamorphosis in animation, which will be explored further in section 5.2.

The process of iterative improvisation continues with each model data being saved, then turned or moved before being re-carved into the next model shape. A number of models are completed (the number being determined by practicalities of time allocation, patience or inspiration to complete the work, or begin the next) and then these models are arranged for the animation phase.
5. PLASMATIC – ANIMATING METAMORPHOSIS

“What’s strange is not the fact that it exists. What’s strange is that it attracts!”

(Eisenstein, 1986)
This section of the dissertation addresses the process of taking the digital sculptures produced into a temporally extended format for final output, and provides reflections on the nature of the animation that results. Theories of animated metamorphosis are discussed with reference to the works created.

5.1 ANIMATING MORPHING SCULPTURE

Improvisation always has a temporal dimension. Spontaneity is a hallmark of improvisation - the oxford dictionary uses the term "spur of the moment" (Stevenson, 2010) to help describe the unplanned nature of the act of improvisation – both the spur and the moment proceed through time. In the case of the Plasmatic series, the temporally extended process of improvisation during which the sculptures are created is distorted, compressed, but critically, is captured in the animating phase. Inari Pesonen states that when experienced, the outcomes of improvisation are often able to serve as a window into process (Pesonen, 2008), and by allocating moments on a final timeline, this phase renders the improvisational acts ‘present’ for the viewer, allowing them access to the extended temporal engagement during the sculpture phase.

Under Eisner’s formulation from the opening of section 4, this phase of the production process would be considered ‘editing’. This is a more conscious phase, and the elements must be handled with a greater regard for the idea that at the end of this stage there will be a finished artefact, and (potentially) an audience. This consideration of the final arrangement is deliberately sequestered to this phase, so as not to unduly inform the forms that arise in the previous phase. Yet this more conscious and conscientious work is directed not towards ‘editing’ as such, but towards capture and preservation of the improvised nature of the inscription phase.xxvii

This move between improvisation and arrangement reflects an oscillation between what could be called unconscious and conscious phases of production, or according to Gelernter’s cognitive spectrum premise, ‘lower’ and ‘higher’ states of thought. It is a change in the state of practitioner, as well as a change in the nature of the operations undertaken.

In the animation phase, the previously sculpted models are imported separately into a 3D animation software, in this case, 3Ds Max (Autodesk, 2015), though most 3D animation platforms would have suitable tools for this task. The initial base mesh (the blob, or squirkle) is assigned ‘morph targets’ – a system that allows this initial shape to distort into another shape, based on vertex position data, as long as that new shape has exactly the same number of vertices and those vertices are numbered in exactly the same order (meaning that this process will not work if one tries to link entirely unrelated mesh objects as morph targets). In the morph target system, each
target is given a percentage value which indicates the degree of influence that the target shape is having on the model. By animating these percentage values over time, it is possible to morph through the shapes in the sequence that they were made, as shown here in Figure 22.

![Figure 22](image)

Figure 22  A view of the software interface showing 3 different morph targets increasing from zero to one hundred per cent over time, in an overlapping arrangement.

The model is then also rotated so that the correct side of the model points to a virtual camera at the moment that a given morph target is expressed. When seen together, the model then morphs and rotates in a sequence that essentially reproduces the sculpture phase (automated, and interpolated by the morphing system) and the wandering phase (by animating the rotation of the model). It is by these simple operations that the metamorphosis inherent in the iterative process of digital direct carving is captured on the final animation timeline.

Because the initial models are created without ‘prior provision’, there is a case for considering this overall approach to animation as part of the tradition of ‘straight ahead’ animation, even though the final stage in the process is a more considered one, and critically, one that potentially facilitates temporal reversibility. Despite the potential for not approaching the production of the models in a straight ahead manner, if one was to return to an earlier sculpture and change the form of that model state, this would result in changes to all the subsequent models which would inherit the change in the relevant vertex positions. Although technical workarounds could be designed to facilitate this revision, such is not the case in the Plasmatic series presented in this research, as this would undermine the authenticity of the improvisation process xxviii. There is some asset recycling in the works, particularly in Plasmatic No. 3. Initially, this was to cohere the works as a series – there is a possibility to attach streams of models into a single timeline. But this experiment failed technically (it was annoying to revert to re-implement previous forms as they
may relate well to the current vertex positions and rotation) but most importantly undermined the faithful translation of the progression of thoughts.

The temporally extended process of sculpting is captured not in time, but in form. There is no preservation of any constancy of temporal progression, or ‘mechanical time’. The time involved (as well as the experience of mentally moving between the model states) is encoded in the relative forms of the digital mesh. It is the temporally engaged experiential process of making that is ‘animated’ in this phase, re-integrating making, and moving into the visual result of digital animation. If these are heterophenomenological instruments, then the meanings that are captured in the final animation reflect the experience of their making – a progression of improvised thought-form over time.

Consider Merleau Ponty’s claims that “the meaning of a gesture may immediately be read in that gesture” (1964). The artefacts presented offer immediate access to their ‘meaning’, and in this case, as well as any meaning that may be inferred by the content of the sculptures, the meaning is an encapsulation of the link between improvisation and animated metamorphosis. The unforeseen, and un-provided for. This immediacy of meaning being embedded in artefacts sets up the recorded improvisation as a particular instrument for phenomenological access; one that provides temporally dislodged, yet paradoxically immediate experience for the audience. Animation is always a medium of recording in this way.

![Figure 23. Progression from abstract to figural from Plasmatic No. 2.](image)

Reviewing the visual animated results as an encapsulation of the making experience, there is constant visual oscillation between the abstract and the figurative. From intuitive material exploration, there is an emergent appearance of ontologically grounded content that asserts itself as definite form. But both within the process of making and the visual result, this vaguely suggested stability of ontology always ultimately remains uncertain. In this form, we can describe the nature of animated metamorphosis as an ontology of the uncertain. It is a trap. Hinting at intentionality or resolvability that never emerges because in the animation stage, in most cases, I
don’t allow it to fully resolve. The apparent resolvability suggests itself both in the form, and also importantly in the mind of the viewer seeking resolution of the form. This tension mirrors the inscription phase, wherein as soon as the image seems complete I move on; in the animation, each ‘finished moment’, both in terms of the model form and the position of the model is given (usually) only a single frame, so that the object is always moving towards, and concurrently away from a resolved form. And the most interesting thing about this is that it moves the mind into this mode of irresolvability. A sense of irreconcilability. It is the inherent properties of animated metamorphosis that allow this to occur over time, testing the tolerances of liminality, visual dissonance and elusive ontological reification.

Animated metamorphosis provides a unique bridge between perceptual effect and theoretical properties – a bridge that can be attributed to its ‘medium specificity’ – animated metamorphosis provides specific outcomes that are unavailable in any other creative phenomenon.

5.2 METAMORPHOSIS AND MEDIUM SPECIFICITY

In the history of animation, fascinations with the possibilities of animated metamorphosis emerge alongside fascinations with the medium itself. There is an element of metamorphosis inherent in the visual change of all animation, particularly if we regard the visual art forms of animation as an evolution of the non-animated image. Some Animation historians have attributed continuing interest in experimental animation as an art form to the medium specific abilities animation to metamorphose;

“The gradual repression of surprise transformation in later commercial cartoons led to their aesthetic decadence, while its survival in independent non-objective and non-linear animation has continually nourished their vitality and creative expression” (Moritz, 1988, cited in Frierson, 1994)

In 1908, the French cartoonist Emile Cohl produced Fantasmagorie, sometimes identified as an early example of ‘stream of consciousness’ animation (Cohl, 1908). The short film, involving a clown who moves seamlessly through a range of scenarios is self-aware in its process of ‘animating’ as a life-giving activity, with the hand of the animator entering the scene to revive the clown after apparently terminal events. The film was initially released under the title Metamorphosis (Crafton, 1990), highlighting that the peculiar phenomenon of fluid transition and transformation was perhaps the most interesting aspect of the film, and the later switch to the final title hinting at a link between this phenomenon of metamorphosis and the bizarre, and the dreamlikexix. The sense that Fantasmagorie relates to a stream of consciousness is primarily
encapsulated in the finished film, more so than in the means of production. The film contains around 700 drawings, and is thought to have been produced over about 4 months (though Cohl is said to have claimed it took a year) (ibid). So, as in the works submitted here, it is not the case that a singular, or discrete stream of consciousness experience is captured. What we do see is a link between metamorphosis as a medium specific property of animation and the artist in an extended process of interaction with the straight ahead animation – engaged presumably in an extended feedback loop of creation, responding instinctively to previous movements, inspired by a combination of these visual stimuli and internal impulse to create the next frames. The reflexive inclusion of the animator into the process of creating metamorphic progression may be a coincidence of themes. Preceding Fantasmagorie, the works of J. Stuart Blackton (1900, 1906), and later, Windsor McCay’s famous Gertie the Dinosaur (1914) bracket the inclusion of Cohl as performer in Fantasmagorie. Yet this deliberate involvement with the technology and process of animation in an ongoing stream-of-metamorphosis prefaces the themes in the Plasmatic series.

The metaphysical position of the pre-Socratic process philosopher Heraclitus was that the fundamental ontological structure of the world is based on ‘flux’, not on stable matter, a view characterised by his statement that ‘Παντα Ρηει’, or ‘everything flows’ (Graham, 2011). In one of the seminal references on theories of animated metamorphosis, Meta-Morphing: Visual Transformation and the Culture of Quick-Change, editor Vivian Sobchack, makes the claim that metamorphosis “destabilises dominant western metaphysics” evoking instead “process metaphysics that is less about ‘being’ than ‘becoming”’ (2000). This dissertation makes the identical, if evident, claim concerning improvisational and emergent art practice. As the Plasmatic series evolved from sculpture experiment to metamorphic artwork, this link was re-enforced: improvised animation, under specific conditions (those described in this dissertation), is fundamentally and unavoidably linked with metamorphosis.

There are obvious origins for metamorphosis in nature, the archetypal example being an insect disappearing within a cocoon to emerge later, miraculously changed into a moth or butterfly. Despite this natural occurrence, metamorphosis in animation theory is often noted for its paradoxically familiar representation of the unnatural; for behaviours, both perceptually and theoretically unexpected and unusual. Sobchack notes that the ‘morph’ is “uncanny not only in the sense of being strange and unfamiliar but also in the sense of being strangely familiar” (Sobchack, 2000). As a visual phenomenon, there is extended discourse on the perceptual, theoretical, political and cultural aspects of animated metamorphosis. These aspects of metamorphosis tend to revolve around its paradoxical attraction and resistance, and importantly, the mobility between these affects.
Perceptually, few familiar substances in our experienced ‘real’ world are able to change their form radically, and those that do (water, lava, etc.) have other consistencies such as preservation of volume, consistency of physics and generally consistent dynamic behaviour, or specific familiarity (such as clouds). Mental functions related to visual processing are adapted to deal with the most common and most useful visual experiences. In the words of William James, “mind and world [...] have evolved together, and in consequence are something of a mutual fit” (James, 1983). In ancillary research to this doctoral candidature, I have speculated, based on the work of neuroscientist Semir Zeki’s work on the visual reception of kinetic art, that the sense of perceptual peculiarity arising from witnessing metamorphosis may have a partly neurological origin. Broadly speaking, the visual cortex has evolved specialised functions in order to process visual phenomena in the most efficient and useful way – to quickly understand the sensory inputs and attach them to higher level concept representations through associative processing systems (Solso, 2001, 2003; S. Zeki & Lamb, 1994). This conversion into concept accelerates useful processing – we can move on from attending to the features of an object that we use to recognise it, and instead consider it in terms of its utility or relations to other objects and concepts. This is in a sense, an evolved efficiency – it reduces cognitive and perceptual load. Since witnessing metamorphosis in real time is very rare, it may be that humans simply lack specialised visual processing features in the visual cortex that would help us more readily digest this strange and unfamiliar sensory input. Further, humans have developed complex neurological arrangements whereby expectations regarding our physical world are regularly ‘checked’ against perceptions, perhaps primarily in an area of the brain called the anterior cingulate gyrus (or anterior cingulate cortex) (Dehaene, Posner, & Tucker, 1994; Gehring, Goss, Coles, Meyer, & Donchin, 1993). The primary purpose of this ‘checking’ function seems to be the redirection of conscious, attentive focus and action when stimuli do not support expectations (Mesulam, 1981; Posner, Peterson, Fox, & Raichle, 1988). Neuroscientist David Eagleman summarises exactly this point, stating that perception is not about data collection, it is about expectation matching; the job of the visual cortex is to generate and maintain an internal model of the world (Eagleman, 2012). Animated metamorphosis denies our natural abilities of perceptual prediction. I intuit that metamorphosis may do this on a neurological level, by specifically confounding this reality or expectation system, continually triggering attentional responses, preventing the viewer from achieving an ontological comfort with what is being displayed, either resulting in visual dissonance, or inexplicable attraction.
Semir Zeki’s inquiries into the neurology of art making and its reception are often based on the “general supposition that, when executing work of art, the artist unknowingly undertakes an experiment to study the organisation of the visual brain” (S. Zeki & Lamb, 1994). In mild retort, this investigation need not be unknowingly, though the outcomes of such investigation may not manifest for the artist, or audience in a format that is immediately useful to neuroscience. And comfortingly, the epistemological hurdle of that translation rests rightly with neuroscientists, not with artists (while clearly, collaboration would be most fruitful).

As an event, or process, metamorphosis defies much formal or anatomical description; this is inherent in the tendency of metamorphoses to transcend expected physical structures and behaviours. But in its animated form, Norman Klein identifies what he labels the ‘ani-morph’, the position during the act of metamorphosis between what an animated entity was, and what it will yet become (Klein, 2000). This allows us to differentiate the constituent parts of an act of metamorphosis – the fixed, punctuating and resolved moments, and between them, the ani-morph wherein, according to Klein, the hand and gesture of the artist is seen. Perhaps it is where the assignation of a ‘form’ or ‘character’ retreats and what remains can only be attributed to the animator. This is both an ontological confusion as well as an epistemological one. In the visual result, animation moves from being a mode of access to a narrative or visual experience and through this perceptual effect now provides access to the animator, their traces and gestures of production. But in the case of the Plasmatic series, this arrangement is significantly altered. It is not the trace of the animator that is revealed between the resolved model states, but the trace of the tool, or the material. The trace of the animator is evident more so in the end points of the morph. Where Klein refers to hand-drawn or 2D animation, these end points would be the most considered, the most carefully informed by a reference design, or model sheet, and perhaps the least expressive. In the Plasmatic series, these end points (or model states) are improvised, and hence not subject to the same careful design and review. If anywhere, the hand of the artist is here, while the ani-morph is the site of contribution from the interpolating software. Taking animator, tool and material together as a system of ‘operational closure’ (after Varela et al) renders this distinction less relevant, but in so far as the ani-morph reveals something different from the fixed end-points of the morph, in the case of the Plasmatic works, the interpolative ani-morph revels a quality of the digital material that is in contrast with the primarily hand-drawn examples offered by Klein – a difference he recognises, musing that;

“3-D applications tend to smooth out glitches and hesitations more than 2D animorphing. Their effects display less of the mercurial, the lightning hand, traced memories, allegories of entropy and ruin.” (Klein, 2000)
If the effect is less mercurial and allegorical, it is at least more revealing in this case of the interaction between hand and virtual material. The ani-morphs of the *Plasmatic* series are a capture of the process, indicated above in Figure 23, of the visual and mental oscillation between exploratory material abstraction and emergent figural representation. The animorph captures the moment of wandering across the surface of the model. It is a trace, however mediated, of the movement of mind.

Further, if the ani-morph in these works captures this fluid mobility of mind that links the fixed end-points of expression, this directly links the final works to James’ conception of the stream of consciousness being arranged as an oscillation between perchings and flights (under his metaphor of bird’s flight) or between substantive and transitive moments of consciousness. The fixed forms represent substantive perchings, and the ani-morph creates a visualisation of the transitive flights. Alva Noë contends that experiential art can provide a vehicle for the phenomenological study of consciousness, stating:

“Art contributes to the study of perceptual consciousness by providing special reflective experiences, becoming a tool for phenomenological investigation. These reflective experiences are transparent, allowing direct (phenomenological) access to objects.” (Noë, 2000)

In this case, the special reflective experience is the experience of animated metamorphosis as a visual analogy of spontaneous thought and the stream of consciousness. Animation is thus able to render the structural properties of internal experience visible, and thereby to transmit, or translate that experience to an audience and it would seem that this very particular heterophenomenological transmission of thought fluidity, punctuated by flights and perchings of thought may only be available to animated metamorphosis.

As mentioned, Sobchack (2000) and others have noted that animated metamorphosis often appears unfamiliar and destabilising and I have offered some speculations above regarding possible cognitive explanations for these reactions of unfamiliarity due to our expectations of material behaviour. But paradoxically, as Eisenstein noted, metamorphic animation is also the site of strange attraction. The tension in this simultaneous attraction and repulsion may arise from the structure of relations to the morphing images. While the liquid, yet active potentiality of metamorphic animation defies relation to the behaviour of familiar physical objects, there is no such incongruence in comparing this liquidity it to the behaviour of mind.
Discussing limitations of physical modelling in stop motion animation, and with reference to the work of Dominique Chateau, Lepot suggests that in contrast to ‘plastic’ cinema, animation offers the opportunity to contest the elastic limits of the objects being animated; to render almost any object as ‘plasmatic’. This allows the visual imagery of stop motion animation to approach a representation of the ultimate flexibility of the mind, which experiences no elastic limits (Lepot, 2014). This discourse on the elastic limits of the physical materials of animation however, is at risk of remaining mired in an ontology that at least originates in the physical. While Lepot argues for the ‘liberation of matter as liberation of mind’ (ibid), this liberation still begins with ‘matter’. In the context of stop motion animation (especially where consideration of actual elastic limits may be a factor in production such as in clay animation), this is sensible. But in the context of digital animation this liberation of matter can instead become liberation from matter. While the virtuality of digital materials may arrive with some technical rationalist baggage inculcated in software designs that so often cater to simulations of the physical world, this virtuality possesses a plasmaticity that is generally free from an originating presumption of a physicality that must in the first instance, be transcended. The works in the Plasmatic series submitted support this; some initial audience suggestions that the animation may have been produced using clay are quickly revealed as incorrect through the sheer mobility and flexibility of the virtual material. While the structure of the virtual mesh object brings its own limitations and considerations (such as the equipotent arrangement of polygons and vertices, or the sense of distance created by the interface) it lends itself more readily to the imposition of metamorphic form over time. In terms of its mobility, there need theoretically be no upper limit on the elasticity of the virtual materials whose properties are subject to definition by the artist and toolset (with the caveat that at some point, ‘elasticising’ the forms would require increasing loads in terms of polygon count and hence processing power).

As a substance characterised by liquidity, elasticity and fluidity in the visual sense, the plasmatic is characterised by potentiality in the dynamic and temporal sense. While the potentials of the digital apparently surpass those of physical materials, the dynamic potential of mind clearly dwarfs both. In the metamorphic Plasmatic works, the intention is to capture the patterns, functions and behaviours, the states of practice and subjective experiences of the mental inscribed both in form in time and sequence. This is inevitably an imperfect capture, and so is always a mere translation. This animated translation occurs through an extended interaction with through the 4th state properties of the digital plasmatic materials.
6. CONCLUSION AND FUTURE WORK

“πάντα ρεῖ (everything flows)”

Heraclitus
Recalling initially the research aims outlined in the introduction of this dissertation, this concluding discussion summarises and integrates the reflections on the creative works submitted and the other research activities.

Outcomes of the research are identified according to the categories and terminology of the iterative cyclic web, demonstrating a range of results that supplement the creative works.

What is ultimately discovered and recorded in this research is an integrated practice of improvised digital sculpture and animation that leads to a visual result of animated metamorphosis. As the tools of production are integrated into an expanded embodiment relation with the practitioner, metamorphosis emerges naturally as an attribute of mind functioning that animation is able to capture and translate into visual form.

6.1 CONCLUSION

JOYFUL PRACTICE AND ANARCHY

As outlined in section 1.1, this research originated in part, in a desire to re-discover a joyful approach to digital animation production and an instinct that this approach would be found by avoiding programmatic and extrinsically motivated modes of working. The series of visual experiments and final exhibited works collectively titled Plasmatic emerge as a record of reclamation of craft intentions, and practices combined with the use of digital technology.

The use of improvised digital sculpture as an integrated part of the animation process is a very particular re-purposing of this recent technology. To use the terminology of the iterative cyclic web methodology, the development and documentation of this new approach is registered as a ‘new paradigm of practice’ (see section 3.3). This new paradigm of practice is the basis for the successful discovery of a way of working that provides the joyful engagement that was initially sought. Which is not to say that the process was, or is always joyful. As noted in section 4.4, with reference to Figure 19 (the pear shaped model***) there were times, particularly before the process was optimised, when the arrangement of the mesh and the relocated densities of the polygon layout become uncooperative and the ability to operate smoothly in translating image impulse into digital form was frustrating. But entering into a willing engagement with the properties of the mesh is not necessarily less rewarding when the mesh imposes its form on the process in a more assertive way.
The process of finding this material engagement, and entering into the negotiated feedback of emerging imagery is an end in itself. In this finding activity, both the form of the digital mesh and the mood or orientation of the practitioner are being composed. The process at its best, is meditative. This meditative state in which the sculpture process takes place is an intrinsically motivating or non-purposive activity. It is not serious. It is something like doodling, or dancing – enjoyable simply for itself.

Much like Frederick Franck, the sculpture stage does not include much (if any) consideration of the finished work that the sculptures may later become part of. Some theorists in the area of improvisation have likewise recommended this suspension of any imagining of the final outcome of a practice, Gary Peters cautioning against giving in to “the demands of the work to be a work” (Peters, 2009).

At the heart of this move into the appropriate state is an attempt to synchronise intention and action. In this, the sculpture phase can be seen as a form of psychic automatism, with the thought ‘happening’ not in the mouth, as Andre Breton suggested, but in a virtual space that is somehow a part of an extended ‘self’. Somewhat surprisingly this extension does not seem to interrupt or undermine the meditative nature of the process which is not about ‘who’ you are, but more an investigation at each moment of ‘how’ you are. This is (like many meditation practices) a distancing or erasure of a sense of self.

Consideration about these states of practice are ultimately considerations of control, and where the locus of that control resides between practitioner and material, and between attentive focussed action and pure gesture. As deliberate intention and real-time critique is lifted (to whichever degree this is successful in a given moment), the sense of imposed will and order is discarded.

Deliberate intention requires an orientation to form, or resultant image that must extend through time. One must be oriented to the future in order to bring its demands to the present sequence of actions. This orientation underpins the technical rationalism of software which is based on providing tools that allow a practitioner to manifest a vision – one must first have the vision, and it is a vision of the future. This future orientation is replaced with an acceptance of emergence of visual form and with a sense of anarchy. This emergent, anarchic permissiveness replaces a sober deliberate seriousness; the images, the forms and the process need not be ‘correct’ and ‘successful’.
One of the key frustrations of this mode of practice is that there is little sense that this emergent process captures a wide part of the rich mental activity that occurs during the performance or production of the sculptures. When most engaged, and mental activity seems lowest, one can really sense that the material engagement is the primary mental content. At other times, a thousand thoughts, ideas, forms and visual suggestions race across the mind. If only they could be captured to the mesh. There is an intermittency to the emergence that is an inevitable aspect of the process. Philosopher Simon Critchley has commented that;

“anarchic creation [...] is the attempt to invert the order of intentionality and to arrest or at least slow down the passage of time. There is a slowness here, an attempt to track things slowly, to reflect, to think at a certain slowness. The pacing and the shifts in temporality are what is essential” (Critchley, 2010).

This seems to be the most positive version of the mind-racing imperfection of some moments of creation. The sculpture process and the behaviour of the virtual mesh, the speed at which it responds to tool pressure, become a substrate on which this slowing of the mind can occur. And this slowing deepens the engagement in a practice that can never practically keep pace with the stream of thought.

**DIGITAL INTUITION**

The opportunity to return a craft orientation to the production of digital forms and animation is facilitated in large part by the invention of new hardware and software. Credit is due to the engineers and designers that create these products in recognition of the opportunities they provide in this regard. In particular, for the production of the *Plasmatic* works, the digital drawing tablet operates in an embodiment relation, reducing the distance between gesture, visual feedback and interior impulse. These tools continue to advance, with newer iterations of this technology including screens that can be drawn on directly. The software used in the sculpture process operates within a relatively new paradigm in 3D modelling, based on the visual insinuation of tactility. This tactility, while only visual, allows a more intuitive interaction than the abstract and logical orthogonal build space it replaces. Taken together, the hardware and software become embodied extensions within a single field of behaviour.

As these new technologies were combined with the meditative states of practice outlined above, a new workflow for the production of animation was developed. In this case, the new technique is not a new paradigm of practice (again using the terminology of the iterative cyclic web), but rather a new applicable technique for creating animation. This new technique of sculpting
iterated models on a high density mesh of uniform configuration and using a morph system to display these to a timeline is now available to be used by any practitioner inclined to do so, and who has access to the relevant tools (which are widely available).

The existence and adoption of new technologies makes new forms of animation possible. While these new technologies represent an improvement in our situation as practitioners, their limitations are not insignificant. The influence of technology and tool choice is both practical and political. We can consider this practical influence by recalling the steps described by Norman McLaren (see section 2.4) for the consideration and management of new animation technologies; briefly, to keep ‘mechanism’ to a minimum, and handle them personally, to use the limits of technology as inspiration for new ideas and to retain opportunities for improvisation (Graca, 2006).

As explained, the drawing tablet and sculpting software are designed on the premise of minimising the ‘distance’ McLaren refers to. It is hard to envision a commercial scenario where the technique and workflow developed in this research would be deployed, so the risk of de-personalisation of the process seems small, particularly given the deliberate inclusion of improvisation, which McLaren also recommends.

McLaren’s suggestion that the limitation of the tools become a source of inspiration suggests that we should initially at least be aware of the limitations of the tools we select for making. These limitations can provide the necessity and opportunity to sequester different aspects of our work to focus on, heightening the opportunities of medium specificity and making the exclusions deliberate, rather than imposed. In the Plasmatic works, for example, there are no colours used. There is no simple way to store colour data in the morph targeting workflow without interrupting the process first with a switch to colouring or painting the sculpture, and then exporting vertex colour data to later be re-integrated with the models. These extra steps would change the attitude of production significantly, requiring greater interaction with the interface and list menus and requiring more frequent shifts to higher states on the cognitive spectrum. But perhaps more simply, when working in an engaged environment based on form and the movement and manipulation of form, colour simply does not seem to suggest itself intently (I also have mild colour blindness of the ‘protanomoly’ or red-green type).

McLaren would agree perhaps with Heidegger that the appropriate manner of dealing with the gestell, or ‘enframing’ nature of technology lies, initially, in awareness of it. We cannot help this enframing in some ways - we necessarily commodify the resources involved (in this case, the digital mesh, the mental intentions), especially when they are dissected and analysed as in this
dissertation. But awareness of this process helps us avoid the extended commodification of ourselves as also existing only in relation to our technologies, and preserve our role as ‘revealers of things’.

**THE EQUIPOTENTIAL OF IMPROVISING AND METAMORPHOSIS**

The creative works and their documentation submitted for examination deliver knowledge about the improvised practice and animated metamorphosis described in this dissertation. The iterative cyclic web model identifies these elements separately. This is partly due to the recipients of the knowledge – exhibitions being aimed at disseminating experiences of the nature of metamorphosis to the interested general public, and the documentation being a more formal record of those exhibition events and the tacit knowledge available within. The recorded animation (in both cases) is a particular phenomenological instrument, able to provide temporally dislodged and compressed access to the process of production, as well as heterophenomenological access to the interior contents and states of mind that inspired and interacted with that production.

In setting up the mesh object, an important correlation is uncovered between the conditions for improvisation in digital sculpture and the properties of metamorphosis and the plasmatic. In this dissertation (section 4.2) I have adopted the term ‘harmonious equipotential’ to describe a virtual three-dimensional mesh object that has the most evenly distributed polygons and is without extraordinary vertices, allowing it to be subdivided indefinitely (within the limits of the processing power of the hardware used). This means that the mesh can be dealt with on the micro and the macro level without irregularities in behaviour.

This structure of this digital mesh has relations to real world material structures. The term valence is used to describe the number of edges that meet in a digital vertex. This same term is used to describe the number of electrons fee to create chemical bonds between molecules of the same or different types. We see then there is a terminological and conceptual link (likely not by chance), indicated by these valences, about the stability or excitation of the physical substance or the virtual mesh. The ‘harmonious’ nature of the digital mesh arises from the evenness of the valences across the mesh. Sobchack describes the liquidity of computerised morphs as “queerly hermetic” (2000). This hermetic quality arises, at least in the case of this work, both from the sometimes precise and unnatural movement of the morph, but also as a description of the structural properties of the material – the digital bonds are as defined and precise as chemical bonds. This even and stable arrangement provides a material neutrality that is necessary for
improvisation of the kind described, and is also relatable to the well documented ‘potentiality’ of plasmatic animation – the mesh can transform into any form without preference. In Eisenstein’s terms, the ‘plasmatic’ is something freed from “once and forever allotted forms” (1986) and this is a freedom that the originating mesh enjoys as it has never yet had a form allotted, preserving its equipotent availability as a substrate for inscription.

The ongoing relationship between improvisation in 3D animated sculpture and animated metamorphosis is further evident when considered as occurring over time. Improvisation is the release of internal impulse, internal imagery or of, or through subsepted and tacit knowledge about material interactions. It is the process of lifting, or withdrawing conscious attention and intention from the process of creation. What remains (in the best cases of this work) is a fluid movement of thoughts and a fluid interaction with the virtual material that occurs during the sculpture process. Images and forms emerge naturally, arising from themselves and each other and this extended emergence is metamorphic. If not immediately recognisable as such, it becomes so once we include the process of that emergence and not simply the destinations in the visual record. Animation, and the \textit{Plasmatic} series makes this process visible, capturing both the ‘wandering’ phase as well as the sculpture from one form to another in the morph rendered as interpolated frames.

\begin{center}
PLASMATIC MIND
\end{center}

While the previous findings relate somewhat directly to the practice of animation, there is also a contribution to the theory of metamorphosis and the notion of the plasmatic that the iterative cyclic web locates in the quadrant of ‘academic research’ (section 3.3), and as such is a contribution that will be most relevant to animation theorists.

Appropriate states of practice, improvisational methods and resultant metamorphosis are entwined because plasmaticness is a property not only of animated material but also of mind. No one medium is fully appropriate for the expression and transmission of the contents of mind – mental thought, functions and processing operate in a format that cannot be fully described, let alone captured within the significant limitation of any creative media we may apply. But each creative platform may offer the ability to express some feature of mental content. In the case of animation, we have the ability to present images over time. And in the case of animated metamorphosis, we discover the ability to express an aspect of mental plasmaticity, this ultimate mobility and flexibility of content. This expression is imperfect, and so can only perhaps be considered a translation, but it is a specific translation that is not possible in any other language –
in any other format. Hence, the medium specificity of animation and its ability to create morphs gives it an important status among media that can be used for investigations of phenomenal consciousness, as animation can perform the function of providing images analogous to how the mind moves from one thought to another.

The *Plasmatic* series supports and illustrates this finding through the creation of metamorphic animation as an encapsulation of a practice of this type of investigation, as much as by displaying the attributes of a plasmatic material and process. Importantly, like mind it is concurrently both material and process, perhaps existing in the paradoxical ‘fourth state’ of matter, or both perhaps existing in states of existence that are not as yet entirely resolved.

The oscillations between substantive and transitive animation states further reinforce the proposal that animation can provide this type of investigation by aligning the attributes of metamorphosis and the ani-morph with the description of William James that the stream of consciousness is an unjointed, unified and temporally extended phenomenon but one punctuated by perchings and flights, or in this case, sculptures and ani-morphs, or states and interpolations.

The visual proposition of the plasmatic is that there is no reliable ontology or constancy in available for viewers to register as a reliable reference; ‘everything flows’. This famous statement from Heraclitus describes not just a mental situation, but an entire metaphysical proposition. Elegantly simple, it is a proposition of a ‘flux’ based ontology of being. Whether we accept this as a basis for our experienced universe, the analogy is that in the plasmatic space of animation, particularly through the use of morphs, everything can indeed flow. This realisation that there is no necessity for things to retain a ‘once and forever allotted form’, may deliver moments of anguish in the existentialist sense – a reminder of the potential for freedom that reminds us of our own. If there is no reliable, visually supported ontology, then we are responsible for the allocation of form, and responsible for the interpretation of the imagery. This may be a part of the inherent bizarreness within the attraction/repulsion paradox of animated metamorphosis outlined through section 5.
If the metaphysical proposition through Heraclitus and process philosophy suggests that there is no constancy in the material sense, then animated metamorphosis presents instead the only constant that remains; the constancy of potential and availability to transformation. This initial lack of constancy, or persistence does not imply decay, destruction or radical shifts in nature, rather, like animated metamorphosis is about mobility, elasticity, progression in sequence, interaction of energies and a lack of preference for form. The plasmatic displays a lack of attachment to externally imposed arrangements that we could equally describe as anarchy, and as equanimity.

6.2 FUTURE WORK

A range of conference presentations have been undertaken throughout the doctoral candidacy. Abstracts from these conference presentations are provided in Appendix 2, Section 9.2.. The first phase of new work following the submission of this dissertation is to reflect on the total process and content of these conference papers in light of the completed research and prepare a number of them for academic publication.

In terms of creative works, the Plasmatic series has been well received and continues to attract exhibition invitations. I intend to make one more video artwork of this type. Following this, I may attempt to create a hybrid short animation that combines a scripted narrative with improvised elements.

New research will involve further inquiry into the application of neuroaesthetics in animation. Initially, some relatively simple pupilometry (eye tracking) experiments are planned simply because of easy access to equipment. Through these initial experiments I think it is possible to show that digital animation can be an ideal medium for the empirical testing of perceptual phenomena because minor variations in stimuli can be very tightly controlled. These experiments could include recognition tests at different speeds or with different physical properties when witnessing morphing objects. Clearly, findings based on testing digital animation have direct application to digital animation, but findings from this type of testing may have broader application in the areas of film studies, perception studies and the philosophy of perception.

To further the practical testing of theories of metamorphosis, a digital 3D environment provides an excellent and efficient testing arena to further explore the anatomy of metamorphosis, in the tradition of Klein. We have much more to say on the morph than simply identifying the morph and ani-morph. This binary approach overlooks the underlying properties of metamorphosis in some ways – these are extensive and continuous phenomena. 3D animation provides the ability
to test, display and discuss theoretical and perceptual differences in ballistics between morphs, additive and subtractive forms through morphs and further understand the anatomy of this critical component of animation that can visually combine and connect concepts.

The key theoretical area not fully addressed in this dissertation is a rigorous consideration of the morph and animorph as a means of investigating philosophies of temporal consciousness. Animation systems impose a mechanical view of time, broken into minutes, seconds and frames, but the experience of time in far more complex. Within this mechanical medium, Sobchack notes the paradoxical ‘temporal reversibility’ of metamorphosis (2000) and I believe that metamorphosis of the type presented in the Plasmatic series can be used as the basis for speculations and visualisations of a range of theories of time that explore this further. Bergson’s concepts of retention and protention for example are visually captured in sequence of morphs that move between substantive and transitive visual and conceptual states. Questions regarding whether we experience time as a series of instants (James calls this the ‘specious’ present), or as a truly temporally extensional phenomenon are fascinating when we consider the theoretical, neuroaesthetic and experimental abilities of the animated image.
7. ENDNOTES
8. LIST OF WORKS CITED
9. APPENDIXES

  9.1 APPENDIX 1 - PRELIMINARY EXPERIMENTS
  9.2 APPENDIX 2 - CONFERENCE ABSTRACTS
ENDNOTES

i. There is some obvious irony in undertaking this work under the structure of doctoral program research, where there is constant external pressure.

ii. For general information about the event, see (Wikipedia, 2016)

iii. Daniel Dennett (and others) contend that the sense of a personalised, unified experience of consciousness is an illusion – a post-facto rationalisation by the mind to explain experience in a way that best serves our interactions with the world: “One of the most striking features of consciousness is its discontinuity – as revealed in the blind spot, and the saccadic gaps, to take the simplest examples. The discontinuity of consciousness is striking because of the apparent continuity of consciousness” (D. C. Dennett, 1991). This position has been described as ‘radical anti-realism’ (Dainton, 2014) in the context of phenomeno-temporal anti-realism – those that contend that our experience of time is illusory.

iv. This passage cannot be quoted directly as there is ongoing debate about the exact Ancient Greek wording. The words of Heraclitus were repeated by others in various forms and only small parts of Heraclitus’ original works remain, known as ‘fragments’.

v. It is impossible to attempt a review of Freud’s full view of the unconscious, though disingenuous to omit mention of the impact that psychoanalysis had on the view of mind in the early 20th century. It seems to have become popular to state that Freud has been ‘disproven’ or more politely, ‘superseded’ – it seems fair to say that the Freudian view is no longer the most productive paradigm for the investigation of mind.

vi. Here, ‘intentionality’ is used in the phenomenological sense, meaning a concept present to a mind, more so than a future plan for action. (For further, see Jacob, 2014)

vii. Throughout this dissertation, the term 3D is used primarily to refer to the virtual Cartesian build space of contemporary design and animation technologies, which operates in three dimensions, even though until recently the output from these programs was a rendered, two-dimensional image, or footage. In this case however, McLaren produced these four films that were intended to be experienced in 3D, through the use of stereoscopic technology.

viii. Cook (2013) equates Eisenstein’s conception of the ‘pre-logical’ to the more scientifically rigorous theory of ‘graphic-functional’ thinking established by Luria, a contemporary and colleague of Eisenstein.

ix Further discussion on this comparison between scientific and artistic experimentation for animation practitioners can be found in my conference paper Hypothesis, falsification and repeatability: reflections on ‘the experiment’ in experimental animation in the proceedings of the 2016 Asia Animation Forum.
x. Confusingly, this point is discussed as point 4 in the source article, but is omitted from the bullet list. I have reproduced this error in the list presented.

xi. On the topic of animation as a ‘superdiscipline, it is appropriate to point out that this idea has been advanced by Alan Cholodenko in his introduction to The Illusion of Life II: More Essays on Animation (2007). Cholodenko makes the claim that “…not only is animation a form of the media, the media – all media, including film – are forms of animation, or rather forms of reanimation” (ibid). This bold claim has specific theoretical intentions, not necessarily preferencing the medium of animation as superior to others, rather aiming to re-purpose the term ‘animation’ as more broadly applicable, while what we currently think of and discuss as animation might be more specifically referred to as ‘film animation’ or ‘screen animation’.

xii. A brief note on terminology: Where introspection is considered an active, searching form of inward looking personal analysis, interoception is a more passive and receptive version of this activity. Interoception includes “the ability of visceral afferent information to reach awareness and affect behaviour, either directly or indirectly. The system of interoception as a whole constitutes “the material me” and relates to how we perceive feelings from our bodies that determine our mood, sense of well-being and emotions” (Fowler, 2003).

xiii. This point appears in Jackson’s paper Epiphenomenal Qualia. Qualia are “the introspectively accessible, phenomenal aspects of our mental lives” (Tye, 2015) In this paper, Jackson outlines a case that qualia have no causal impact on the world and hence can be labelled ‘epiphenomenal’. This is an argument for dualism, since qualia exist yet have no direct material impact on the world (Jackson, 1982). Jackson later changed his position on this point, but the reference in this section is not undermined by his change in position - in fact it may strengthen the point that if qualia are not epiphenomenal (or do not exist at all) then the observed behaviours of a subject may be more strongly causally linked to their internal experiences.

xiv. The use of heterophenomenology in order to study the qualitative nature of consciousness contributes to Dennett’s ‘multiple drafts’ theory of consciousness, whereby consciousness exists as multiple streams of content specific activity that only appear to be a single coherent stream upon reflection (Dennett, 1991). The briefest possible explanation of this is due to the fact that Dennett does not believe that there is a specific moment in time where unconscious mental processing becomes conscious, nor a specific site for this activity. Thus, consciousness is largely illusory - a post-hoc explanatory process for making sense of our experience in the world.

Primary objections to this heterophenomenological approach include that one can be sceptical (in line with Dennett’s own view) as to whether the subject actually has any immediate (non-reflective) subjective internal experience, and that it may be of limited use in consciousness studies as it is “likely to leave something out that is of central importance to the nature of consciousness” (Velmans, 2007).

xv. This notion of an animated work as a text may seem to invoke a discourse on authorship in animation, which is well established, particularly by Paul Wells (2002) and more broadly, as in the tradition of film and media scholarship. This approach is beyond the scope of this research and is mentioned here only in the context of the argument for creative artefacts to act as heterophenomenological instruments.
xvi. Eagleman actually points out that there may be more than two systems, and uses the rational/emotional contrast to illustrate the potential for internal disharmony, or for the opportunity for system selection in the mind.

xvii. Dasein can be thought of as the distinctive mode of presentness or existence that forms part of the basis for Heidegger’s existentialism, particularly in Being and Time (Heidegger, 1996; Wheeler, 2015). Further exploration of the term is beyond the theoretical and practical scope of this research, other than to mention the similarity of this specific starting orientation to a world (here a virtual world space and object) that already has properties and qualities and ‘exists’ before our interventions.

xviii. The process of increasing the number of polygons that constitute a 3D mesh for digital sculpting is achieved by executing an operation known as a Catmull-Clark subdivision, whereby vertex intersections (points where edges meet) are moved and new vertexes are added, increasing the mesh complexity and making the distance between points smaller. This type of subdivision is not unique to spheres, it can be applied to a mesh that has been deformed or shaped into any arrangement. By increasing the mesh density, a Catmull-Clark subdivision makes the object appear smoother.

xix. An alternate, though less suitable solution for the uneven distribution of vertexes is to use a type of geometrical object known as a geosphere, or ‘icosphere’. These spheres use three sided polygons and can include tetrahedrons (four faces), octahedrons (eight faces) or icosahedrons (twenty faces) like the one pictured in the image below. These are sometimes referred to as icospheres.

![Figure EN1. An Icosphere used as the starting point for the base mesh, showing minor extraordinary vertices](image)

While these objects have the advantage of evenly distributed polygons, the use of triangle shaped polygons is problematic because when the Catmull-Clark subdivision is applied to this mesh in the software used for sculpture, a number of extraordinary vertexes are created. These extraordinary vertexes have valences of either five or six (in the case of the icosahedron, shown here), and while they do not increase in valence as the mesh is repeatedly subdivided, these points are inferior to a more uniform distribution of polygons and vertex valences.

xx Malcolm Cook refers to the plasmatic attribute of animation as ‘pluripotency’, where here I use ‘harmonious equipotential’ to describe the quality of the digital mesh (Cook, 2013). The underlying property of vitality without hierarchy is more important than the terms applied, but it is interesting to have arrived at such similar terminology.
xxi. In animation and digital image production there may also be a correlation with the business aspect of mass manufacture alluded to in the above passage, with this commercial motivation cast in contrast to the individual practitioner engaged in creative, responsive or conversational relations to their materials, whether virtual or physical. This correlation is not an equivalence of materials, but of attitudes, attunement and orientations of the crafts-person and the digital artist.

xxii. A number of versions of the ZBrush software were used for the creative works presented, but predominantly ZBrush 4R6 was used.

xxiii. Psychologists have called the reciprocal entailment of perception and interaction with the world the ‘Action-Perception Loop’ or ‘Sensorimotor-Causal Loop’ (Block, 2005).

xxiv. There are devices available, and quickly becoming ubiquitous that allow drawing directly on the display surface.

xxv. The software under discussion is somewhat different in nature (Wood specifically focuses on the use of Maya, though it should be noted that one of the trajectories of 3D animation software design is the ability to customise the interface metaphors and workflows to suit a range of approaches). Zbrush uses the metaphor of a material substance (by default, red clay) that can be sculpted by the artist by operating on its surface with a pointing device (mouse or stylus). The notion of adding or subtracting to a clay-like substance is very different from the engineering-like approach used (by default) in Autodesk’s Maya. The technical software process also differs. Maya uses a conventional approach to storing vertex positions in Euclidian space, where Zbrush uses a 2.5 dimensional ‘pixol’. This is important only because it facilitates the animator in approaching the mesh surface as an entity undifferentiated by the interruption of vertices and polygons. The metaphors of space and vision also differ slightly between Maya and Zbrush. One of the key differences is that Zbrush (by default) offers only a single view of the workspace, which is (by default) a naturalistic perspectival space where distant elements are smaller, and closer elements are larger. While the default view in Zbrush is a single window onto the scene space, multiple viewpoints can be achieved by installing 3rd-party software plug-ins such as Zsnapshot or running additional software scripts such as Quadquick. In Maya, the ability to have concurrent views from more than one side, whether orthogonal or in naturalistic perspective views, gives a sense of ‘omniscience’ to the process of creating the scene. In Zbrush, the singular view is similar to a normal perception of an object, yet the virtuality of this object is apparent through its unconstrained ability to rotate and move with the viewpoint. It is not apparent in Zbrush that the object-space of the model is linked with the world-space in the scene, so whenever there is only a single object in the scene, the animator has an experience of intimacy with that object, that replaces a world-building approach that one might experience in other 3D animation programs.

xxvi. This process is often used in applications such as animating the facial expressions of animated characters. Conventionally, this process of morph-shape targeting works best on models where the underlying structure of the form does not change significantly. In this research, the models, do change structure and form significantly, meaning that there must be many more polygons constituting the model, as mentioned previously.
xxvii. It is fair to say that there were moments when some creative, animation knowledge ‘leaked out’ during this editing phase. In Plasmatic No.1 for example, the facial features of a ‘figure’ seems to blink – the eyes closed and open were sculpted intuitively, sensing that here, the thing should blink. In the editing phase, appropriate timings for the model positions to properly represent a blink were included almost without thinking, and later pointed out by a colleague. There are some other minor examples of this, such as the instinct towards overlapping action. This also involved occasionally using a model state more than once, but the notion to do this was a natural part of the intuitive process. The ability to do this became an integrated part of the thinking process during the sculpture production.

xxviii. There were times during the production of the works when this was very tempting. Some sculpting sessions produced more resonant experiences than others, and while there is an effort to accept the results without judgement, this was easier when they surprised, engaged or impressed.

xxix. Fantasmagorie (or Phantasmagoria) was an early form of theatre using a type of projection lamp to cast a series of (often macabre or disturbing) images in a sequence (Heard, n.d.).

xxx. The abstract for this conference paper which is still in development is available in Appendix 2 (section 9.4).

xxxi. Pun intended
LIST OF WORKS CITED


Zbrush. (n.d.).


APPENDIX 1 - PRELIMINARY EXPERIMENTS

These initial experiments preceded and led to the use of digital sculpture technology and 3D animation for improvisation.

THE STRAIGHT-AHEAD MACHINE

Among the first items produced in the pursuit of the research goals described was a physical device that increased the speed and focus of straight ahead animation on paper. A traditional animation disc works by using a backlight and drawing on top of a translucent section of plastic so that marks drawn on a piece of paper can be seen on subsequent sheets that are stacked on top.

In a process of straight ahead animation, new frames are produced without returning to previous frames to make alterations. Some forms of animation impose this approach, for example animation that is made up of photographs taken in sequence of a scene or models or any other object that is changed between the photographic capture precludes the animator from returning to previous states to change the arrangement of the image without significant difficulty.

It was intended that this machine would help foster a focussed attitude towards making animation frames by removing the temptation to alter previous frames as well as making the process of managing the stack of paper on which frames are drawn faster and more automatic.

The animator begins by loading paper punched with a standard two-hole punch onto specially designed steel rails. The paper is held above the drawing area and a new sheet is brought forward to the transparent drawing surface from the holding position by flipping it over the guide rails, like turning pages in a 2-ring binder.
As the animator finishes a drawing, the drawing surface is slid to the right as seen in Figure 24 above. As the acrylic drawing surface slides from under the sheet, the paper is held in position by the rails, and drops to the lower transparent sheet of acrylic. Then a new sheet is flipped onto the drawing surface by the animator from the stack above. This initial drawing can now be seen through the new sheet and can be used as a reference image for the new drawing. When the second drawing is finished, the process is repeated, but this time the first drawing drops through the second plane and out of the drawing area, to be stored on the rails which extend beneath the table surface and hang beneath.

At any one time, the animator is able to see only one previous drawing. This encourages working quickly, holding the movement of elements in mind and relying on the reference drawing for only the loosest idea of relative spacing. The animator must rely on working memory as well as muscle memory, reminiscent of Len Lye’s description of working with scratches on film in the production of *Free Radicals* (1958). Without the ability to see exactly what the relation of one drawing would be to the next, Lye’s scratches become a reference to an internal working sense of relative placement – movement captured as a result of working with the physical feeling of the line’s shape, position and nature and changes to these over time. These types of impressions about the lines being produced are more like the cognitive unconscious processes of implicit memory described by Khilstrom than they are like any sort of unconscious content, in that they are driven by automatic motor processes and not as a fully descriptive revelation of complex interior content.

The straight ahead machine was partly a response to Andre Breton’s discussion of mediums suitable for use in psychic automatism and the need for the artist (or writer) to be able to work at the ‘transcription speeds’ necessary for capturing the interior speed of thought (Breton, 1974).

This was a partially successful experiment. Although it provided an interesting apparatus for initial testing of straight ahead animation at higher speed than a traditional animation disc, it became clear that new encumbrances caused by the imperfection of the mechanism eroded any advantage it may have over digital tools. It was successful in altering the traditional paper based animation system in that it imposed straight ahead practice without pause or review, but the physical benefits of working with tactile materials and familiar tools (pencil and paper) did not outweigh the efficiency of working in a digital environment.
PAINT, CANVAS AND CAMERA

Included in the supplemental works as Experiment 2, this short effort involved animating paints on canvas under an overhead camera. This is an established animation technique that imposes a straight-ahead approach due to the nature of the materials being used. It is not possible to undo or review created frames, although planning is possible. There is a rich history and practice of planned animated films produced in a straight-ahead manner, using paint under a camera.

In seeking a link between the use of paint and an improvised or automatistic approach to animation, this experiment was in part inspired by Norman McLaren’s 1952 short film *A Phantasy*. In this short, McLaren uses painted animation assets and scenery that are cut out and animated under camera. While this technique differs, there is a stylistic connection, and the film appears to take an improvisational and straight ahead approach. The oneiric themes apparent in McLaren’s film suggest some links to this experiment via surrealism, and at this stage my own experiments were influenced by the documented practices of surrealism.

Figure 25. Frames from an animation experiment using paint on canvas under camera.

Abstract expressionist artists working with psychic automatism often related an intimacy with materials which I feel is also reflected here, with the captured frames able to explore this dialogue with materials over time as well as space. In particular, the initial sequences of this work involve over-wet gouache paints which are later painted over with oil paints, recording the chemical interaction of materials. There is also a multi-temporal register and unique interaction of material and temporality caused by such interactions as the time taken to animate vs the time taken for
the paint to dry. This is an uncontrolled version of one of animation’s strengths, that is, the ability to manage and present multiple time experiences to audiences.

At the end of the sequence, physical objects are introduced in a technique which echoes the surrealist tendency to de-contextualise objects, a technique that evolved from the Dada concept of the ‘object trouvé’ or ‘readymade’. The spinning green handles in this experiment may be considered animated readymades. I sense this was a consciously known opportunity and connection at the time of production, but the selection of the object and its motion was instinctive, or spontaneous. These were objects to hand in the production space.

SEQUENTIAL ART – STATIC

Figure 26. A record of experiments with unplanned sequential drawings.

A series of illustrations was produced in reaction to the feeling that many of the initial experiments were based around a series of automatic moments rather than with a continuum of movement produced automatically. These illustrations were an attempt to unwind the automatic image impulses into separate sequential moments, rather than animated movements. These illustrated experiments sought to understand the linkages between the image impulses visually and spatially, displaying the interactive visual forms in a single image.
Mental image impulses must always have some temporal extension in terms of their internal experience. This experiment sought to capture these internal image moments individually, frozen in time, in order to better understand the connections between them.

In the image above, each row of frames represents a drawing session executed over the space of about 30 minutes. Each image is an attempt to capture a single spontaneous mental image or arrangement as a static image. Some of these images emerge during the process of drawing the frame, while others arise during the previous frame, and inspire the move to the next drawing moment, sometimes encouraging a rushed completion of one frame so that the next can begin. There was sometimes a sense of wanting to move through time – wanting to be already in the next frame before the current one was finished, revealing one of the challenges in never being able to keep up with the speed at which concepts can move through consciousness.

Perhaps the most interesting phenomenon to emerge from this attempt at imaging the spontaneously arising image was to notice and record the degree and nature of the interactions between frames.

![Figure 27](https://example.com/image.png)

Each drawing influences the next as the concepts and visual arrangements extend across the frame space and through time.

In this subset of images, I can recall the influence between frames based on notes and observations that were made at the time. Visual and spatial associations lead to conceptual associations and vice versa. The first image shown is a reference to the idea of sleeping – personally relevant at the time due to suffering from insomnia. The subsequent image re-imagines the shapes of the body as brainwaves and appropriate mental electrical frequencies for sleep – this is some sort of graphing of ‘sleep waves’. The next image acknowledges that this topic was something I had recently read about, by depicting it printed in a book. There is some sort of self-criticism going on here; some sense of irony that reading about sleeping was not useful in sleeping more. There is reluctance to draw this frame. Reading then evokes a pile of books that then visually correlates to a hamburger. The compression of that food between the top and bottom reminds me of passengers compressed on public transport (my ordinary mode of travel at the time).
The next frame shows a type of mental ‘zooming in’, revealing a detail of one of the shoes of a passenger from the previous image. And the final image on that row is a bowl of popcorn. In this instance, the bowl of popcorn emerged as the line from the previous panel extended across the boundary of the frame. Initially, it was to be another frame of the front part of the shoe, and only after this line was added did it become first visually, then mentally, a ‘bowl’. This final connection relates directly to the process of automatic drawing where it is understood that elements of a drawing will influence subsequent drawn parts. But in this case, the elements are not able to occupy the same space. So these elements are separated spatially, but this spatial arrangement represents a separation of these experiences through time.

This was a significant moment in the early experiments. I understood at this point that this continuum of visual form was available in animation through movement and transformation where in illustration it was spatially separated. This seemed to be the same thing, with the concepts simply connected through a different dimension in each of those cases. In retrospect, these experiments captured something of a substantive thought, while omitting the transitive thought movement, which (in the spirit of Scott McCloud, author of *Understanding Comics: the Invisible Art* (2011)) occurs in the gutter between frames.

**SEQUENTIAL ART – ANIMATED**

A number of short 2D animation tests were produced to explore different techniques and approaches to producing unplanned straight ahead animation (and to assess some different software solutions for their suitability to produce improvised animation sequences). During the production of these experiments, frames were produced quickly, with an emphasis on movement and space relationships over time rather than within each frame. Various approaches to ‘onion skinning’
were tested, using varying degrees of visibility for previous frames. A collection of these experiments is included in the supplemental works, titled Experiments_01.

There were recognised challenges here to discard learned or known 2D animation principles in constructing movement, which was not always successful.

Overall, the experiments with 2D animation did not yield positive outcomes for further inquiry. Results were largely anticipated. It is possible that there are further opportunities for this type of animated improvisation in 2D animation software, but further work is not planned at this time.

**OTHER**

Other experiments with more abstract image making approaches were tested and discarded. In this example, software called Chaoscope (Desprez, 2006) was used to test the possibility of automatically generating animated transitions from one form to the next and using those generated forms for the starting points of improvised animation. In the tradition of Andre Masson’s description that a latent image would “reclaim its rights” (Turner, 2011), it was hoped that in this experiment images might suggest themselves within the abstract forms produced by the Chaoscope software that would serve as the starting point for subsequent animation.

It was found that either this did not happen, or that nothing of great interest was added by animating in this way – both the animation and the generative fluidity of the Chaoscope software suffered from the process.

The result of these various experiments was an informed familiarity with the processes of improvising in different ways with the drawn and animated image. I became familiar with the
particular nature of the limitations of each approach, which all differed. However, none of these methods seemed to offer the potential of finding a new, or insightfully productive means of improvising with animated images. The best of them were established (straight ahead with paint and comic style images), and others were unrewarding as practices and/or aesthetic objects.

9.4 APPENDIX 2 - CONFERENCE ABSTRACTS

This section includes a chronologically arranged record of abstracts that were accepted by review and presented in person at academic conferences and events during the candidature.

To date I have focussed on in-person presentation of research outcomes, with a written publication agenda based on these and other elements of the dissertation to follow the candidature, as mentioned in section 6.2.

2012 SOCIETY FOR ANIMATION STUDIES (SAS) CONFERENCE, MELBOURNE AUSTRALIA


Formalised by Andre Breton and the 20th Century Surrealism movement, psychic automatism is a process whereby an artist seeks to represent the poetics of the ‘unconscious’ through text, image, or other artistic channels. Animation offers a unique opportunity to extend this practice by producing works which combine the spatio/visual characteristics of automatic drawing with the sequential and temporal attributes of automatic writing. As a unique questioner of reality, the medium of animation may add new dimensions to this surrealistic practice.

The surrealists saw their view of the unconscious as fundamentally complimentary with their contemporary psychoanalytic counterparts and these views may now be considered as referring to the affective unconscious. The cognitive revolution of the 1950’s supplanted strict Freudian structuralism with ideas we may consider as referring to the cognitive unconscious. John Searle for example, suggests a spectrum of consciousness which includes peripheral falloff zones between conscious and unconscious states which occur both spatially and temporally, implying that the phenomenal duration of the moment of ‘now’ may extend into past and future – an exciting prospect for animators.

This paper proposes that the consideration of a cognitive unconscious can aid in the development of new animation techniques based on psychic automatism and aimed at the incubation of implicit thought reified as animated entity. These processes being developed focus on straight
ahead animation and include sequenced 3D sculptural modelling, computer aided morphology and digital collage, and I propose to share new examples during the presentation.

2013 DIGITAL INTERVENTIONS CONFERENCE, PERTH, AUSTRALIA

Interventions in 3D Animation workflow - Two Approaches to Circumventing Restrictive Production Procedures.

Written and presented with Gina Moore

For creative artists, a suite of digital tools offers steadily increasing production capacities and broadening opportunities. But inherent in these tools is a complexity of machine operations which often impose a programmatic approach to art-making at odds with spontaneous and emergent visual practice. The unique conversational encounter with materials is often lost. According to Brooks, cultural evolution relies on accidents, mishaps, and incursions of the unexpected, yet digital tools in 3D animation production imply rational planning, structure and intention.

We present preliminary finding from two practice-based research projects which explore the unique creative opportunities and limitations presented by 3D animation software.

Each project adopts a different approach to circumventing the restrictive production procedures inherent in 3D animation software and by subverting the intended production stages, new forms of practice deliver a new range of visual results.

Approach 1, “Animation and Intuition”, utilises 3D modeling software to extend the tradition of automatism and improvisation, indulging intuition, spontaneity and emergent forms in virtual space. This approach prioritises the direct interface with virtual form and the sense of tactility and feedback between artist and mesh. Results are metamorphic and unpredictable.

Approach 2, “Modelling as Animation”, also seeks opportunities for improvisation and spontaneity, but this time through cultivating an understanding of the technical aspects of the software. As well as examining the philosophical assumptions implicit in design of 3d software, this approach seeks to understand the nature of computer code and the procedures which operate behind the user interface.

By acquiring a “feel for the materials” (the stuff of which the software is composed) the aim is to develop “conversational” qualities of practice in which “listen[ing] to the materials” becomes as important as the explicit intentions of the artist. Unexpected outcomes are achieved by allowing
the imposition of the "materiality" of the software. The artist then intuitively responds to these surprises as either unwanted mistakes or creative opportunities.

We propose a paper presentation as well as contribution to the creative showcase or exhibition attached to the symposium. The paper will illuminate the methodological and theoretical issues involved with this intervention into 3D animation practice, while the animated works will display the expanded range of visual results arising from these altered approaches to digital practice in the creative arts.

2014 SOCIETY FOR ANIMATION STUDIES (SAS) CONFERENCE, TORONTO, CANADA

Dali, Disney, Destino; Speculations on Metamorphosis and Multistability.

In 1945, a collaboration was initiated between Salvador Dali and Walt Disney to produce a short ‘episode’ for a larger combined animation film project. The project was titled Destino and was based on a Mexican song of the same name. Dali had previously referred to Disney as a surrealist, and said of the Silly Symphonies cartoons that “One always believes to have ‘dreamed’ those dazzling ‘cataclysmic rainbows’.”

Unfortunately, despite some moths of work by Dali at the Disney Studio, the film was cancelled with only about 15 seconds of animation completed, most likely due to financial and practical constraints at the time brought about by World War Two. The project was much later revived, and released at the 2003 Annecy International Film Festival.

Despite the passage of time, some records and scholarship reveal much of the practical arrangements between Dali and Disney at the time and the involvement of the Disney studio artist John Hench in the production of the 2003 version of the film lends credence to it being an accurate interpretation or translation of the plans, storyboards and intentions of Dali and the team during the initial production. Scholarship of this work rests chiefly on the historical aspects of its production and on formal analysis of the film and interpretation of Dali’s unique symbology.

Study of Destino is challenging due to the problematic production history over such a significant time span. This paper is a speculative exploration considering Dali’s motivation and attraction to animation as a medium and the ways in which animation processes fit with other theories of surrealism and Dali’s psycho-strategic artistic agenda. The paper focusses on 2 key techniques used throughout Destino; multistability and metamorphosis.
Multistable images are those which can be interpreted in more than one arrangement, as depictions of more than one thing, or scene. This technique was one used frequently by Dali but primarily in static images. The use of animated multistability in Destino presented Dali with opportunities to expand on his other artistic methods and his desire to reveal the unconscious functioning of thought. Though Dali was heavily involved in surrealist film, animation and Destino offered the opportunity to add a temporal dimension to the psychological explorations and expressions in his painted works. Dali stated that his ‘paranoiac critical’ method was the “spontaneous method of irrational knowledge based in critical and systematic objectivity of the associations and interpretations of delirious phenomena”. Creating perceptual conundrums for viewers allowed Dali to create and share these ‘delirious phenomena’ and animation offered Dali an ongoing engagement with the mind of the viewer, combining the temporal aspects of cinema with the visual arrangements found in his painting.

The second technique, metamorphosis, is one more common to animation study. For Dali, this technique may have offered new opportunities for his pursuit of his unique artistic agenda – metamorphosis becomes a vehicle for highlighting the (his) unconscious association between objects and entities. Additionally, animation provides the opportunity to translate not merely the objects and their associations, but as a temporally elapsing medium can communicate the very act of association itself. In this pursuit animation offers clear advantages over either film or painting.

Dali had claimed that the film Destino was “an effort intended to initiate the public into surrealism, better than painting or the written word”. I believe Destino offers an opportunity for insight into Dali’s unique processes and approach to surrealism, but in addition, the film reveals theoretical insights into the use of these now well-known techniques for other animators. Both metamorphosis and multistable imagery induce affective perceptual and cognitive consequences for the viewer.

Dali’s use of these techniques provides a theoretical reference point for the idea of improvisation in animation; not an improvisation at the level of toolset materiality, but a cognitive improvisation involved with the free conceptual experimentation with the structure of animated works, the linkage of imagery and narrative arrangement.

This new study of the techniques used in Destino lead to a speculation that Dali found in animation a surreal medium better able than others to convey the temporally embedded associative functioning of thought, both at the level of the animator’s practice and as animated artefact.
The Animorph and Temporal Consciousness

The purpose of this paper is to expand on the theory of the ‘animorph’ in 3D animation - the isolated, transitory state between stable end states in a metamorphic progression. The experience of this animorphic state can be unconsciously and temporally suggestive and observed both in isolation and in progression, the animorph disrupts assumptions between perception and reality.

From the perspective of an animation practitioner focussed on digital sculpture and metamorphosis, this paper provides a temporal and anatomical overview of the animorph. This dissection is cast against a history of competing theories of temporal consciousness that stretch from Heraclitus’ theory of ‘flow’ and alternately contend that our conscious experience of time and movement is retentional, cognitively re-assembled, or consists of a temporally extended embodiment. The use of these competing theories allows the visual animorph to become a site for philosophical, as well as visual enquiry.

The implication of this research includes an expansion of the theory of the animorph through its specific application to 3D animated interpolation and metamorphosis. The analysis of the animorphic state and discussion of theories concerning its perceptual and cognitive potentials can inform the work of animation and other image practitioners.

The case for Improvisation: New Approaches to Animated Digital Sculpture

For creative artists, a suite of digital tools offers steadily increasing production capacities and broadening opportunities. But inherent in these tools is a complexity of machine operations which often impose a programmatic approach to art-making at odds with spontaneous and emergent visual practice.

The unique conversational encounter with materials is often lost. According to Brooks, cultural evolution relies on accidents, mishaps, and incursions of the unexpected, yet digital tools in 3D animation production imply rational planning, structure and intention. For 3D animators and CGI artists, the technical rationalism imposed by software systems may limit both the visual results and the responsive art-making experiences available to practitioners.
Malcolm MacCulloch questions whether eventually the mind, working with the stream of ‘fleeting, freely-associated’ imagery may eventually be reunited with the knowledge-bearing ‘hand’ through the development of software sufficiently intuitive in its interfaces and operations to facilitate the expressive spectrum of human abilities and imagination. Citing Focillon, MacCulloch outlines a desire to return to a “pure phenomenology of sensate presence” imagining a software based reversal of the erosion of concentration and calmness, and a return to contemplative, rather than analytical evaluative visual responses to digital crafts.

Working with the perpetually moving stream of new software opportunities, how might the digital artist circumvent restrictive practices? This paper explores opportunities for improvisation in the 3d animation workflow through the ad-hoc re-purposing and intentional mis-use of 3D production software. This exploration will focus on a current project using improvised, animated digital sculpture to re-inject spontaneity and open-ended creativity into digital practice.

This re-injection of improvisation and attempt at bypassing the multiple ‘removals’ between the hand (and eye and mind) of the artist and the produced artefacts draws on the notion of the extended mind, and material engagement. Lambros Malfouris describes the synergistic site of this action on, and direct manipulation of material culture as an ‘act of thought’; a cognitive act. As digital artists come to consider their use of tools as intuitive, embodied and even unconscious, these computer/artist relations become important both for the artists using the software and for software developers focussed on “artist friendly” toolsets.

The visual results of digital improvisation are unpredictable, raising questions about the status of digital artists as artists or as production specialists and this question of industrial/cultural status may return an impact on production methods and tools. This is relevant for many practitioners and theorists as it reflects a common tension in electronic art between poesis and praxis.

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**Changeable visions of animated metamorphosis**

Studies in the neuroanatomy of the visual cortex have shown that specialised vision activities occur both at the regional and cellular level. Evolutionary biology would suggest that the specialisations arise in response to features of the visual environment and benefits to observation – motion attracts attention, edges define forms and our perception of objects changes based on their position in our field of view. These specialised visual processes allow for an efficient
comprehension of objects and our surroundings, processing biochemical signals into conceptual schemata (Solso, 1996) a process Danto calls ‘pictorial competence’.

But animated metamorphic objects don’t adhere to the normal physical properties that our eyes have adapted to. The characteristics in animation that Eisenstein called the ‘plasmatic’ can confound the process of recognition, preventing the visual system from achieving a stable ‘ergodic’ allocation of visual effort. Attractive features disappear, edges dissolve and visual suggestions of physical properties are unreliable.

This paper discusses the implications of animated metamorphosis from the perspective of visual processing, cognitive load attention and the transfer of instability from object to viewer. The ‘unreliable’ qualities of metamorphosis offer a wealth of opportunities for destabilising affects.

2015 ASIAN ANIMATION FORUM, BUCHEON, KOREA

Can Animated Metamorphosis Represent the Stream of Consciousness? The Fluid Aesthetics of Plasmatic No.1, No.2 and No.3.

This paper is based on the Plasmatic series (Buchanan 2014-2015), a recent animation project using animated digital sculpture to create metamorphic images that represent the process of spontaneously arising mental imagery.

Aesthetic considerations specific to the medium of animation based on visual processing of movement and image cognition can be actively used by artists to exemplify, extend, experiment and exaggerate perceptual phenomena. Following this approach, artists can actively participate in the study of perceptual consciousness (Nöe, 2000). For this research, the medium specific approach to animation aesthetics is concerned with the processes of perception and not with the symbolic, cultural or semiotic content of the images produced.

These aesthetic considerations of images in motion (and to paraphrase Norman McLaren, images of motion) rely in part on understanding the correlations between objects of perception and the functional structure of the mind (Zeki, 2002). Mental functions related to visual processing are adapted to deal with the most common and most useful visual experiences. In the words of William James, “mind and world […] have evolved together, and in consequence are something of a mutual fit”. (James 1890)

Animation is not restricted to creating simulations of the external world. Perceptual events created by animation can be representations of a range of 'internal' or mental experiences.
In 1890, William James observed that the ongoing process of spontaneous thought in the mind occurs as a continuous stream - the stream of consciousness. These thoughts are linked together - they do not start and stop abruptly, but rather are connected, and overlap through a series of 'substantive' and 'transitive' states (James 1890).

The *Plasmatic* series presents a new form of animation based on improvisational digital sculpture and 3D animation morphing. These morphing animations represent instinctive and spontaneously arising forms and images linked together without interruption in a constantly evolving 'plasmatic' oscillation of ‘substantive’ and ‘transitive’ states.

This paper will demonstrate through example that animated metamorphosis can represent and simulate the way that internal mental images arrive and depart from the mind in a way that is unique to animation and unique to metamorphosis. The presentation will directly compare William James' explanatory diagrams and the tool interfaces in 3D animation software. The conclusion of this research is that animated metamorphosis can represent specific internal mental processes and experiences that other mediums cannot, creating opportunities for unique aesthetic experience.

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2016 SOCIETY FOR ANIMATION STUDIES (SAS) CONFERENCE, SINGAPORE

**The role of practice as a methodology in transdisciplinary animation research.**

Transdisciplinary research emerged as a reactionary response to the perception of fragmentation between disciplines in academia and disconnections between knowledge domains that did not reflect the integrated nature of humans and their world. In an attempt to respond to the challenge of the “spiritual and material self-destruction of the human species” and the threat to life “by a triumph of techno-science that obeys only the terrible logic of efficacy for efficacy’s sake”, in 1994, physicist Basarab Nicolescu presented the Charter of Transdisciplinarity on behalf of the first world congress of transdisciplinarity.

This charter sets out 15 Articles, or guiding principles that seeks to encourage and empower transdisciplinary researchers to pursue knowledge in a hopeful, open and unconstrained manner.

Animation is a natural site of hybridisation in the visual, spatial, temporal and plastic arts. Animation studies is likewise multifaceted. With the recent popularity of practice based research in the creative arts, we now question the place, status and relationship of animation practice as research in the context of transdisciplinary animation studies.
This presentation will explore animation practice through the model of the 15 articles of transdisciplinarity, highlighting those that are of particular relevance to Animation practice. For example, article 11 calls for a revaluation of intuition, imagination, sensibility and the body in the transmission of knowledge. Animation practice and the artefacts it produces can do this in ways that textual analysis cannot.

As well as the obvious and now well documented methodological formulations, embracing animation practice as an approach to transdisciplinary research in animation studies may have an impact on animation research inquiries, as well as pedagogy, program structure and integration, archiving and publication of research outcomes.