# A practice-led investigation into the role of play as a feedback mechanism between the human and technological systems – as revealed though art & digital technology projects.

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**Abstract**

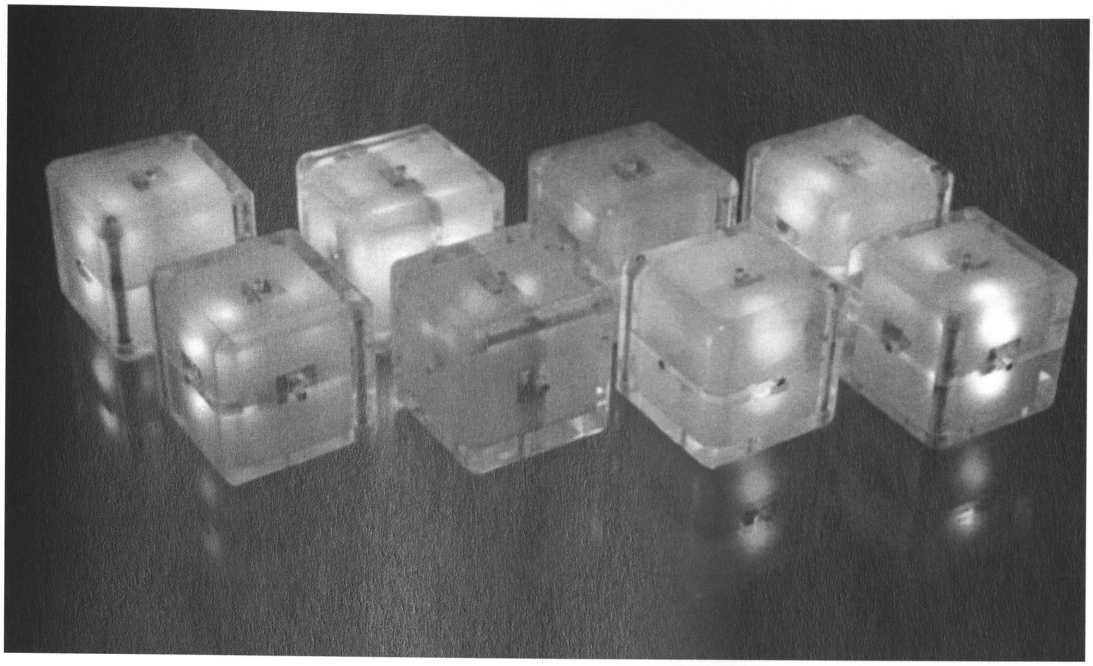
This practice-led research explores the techno-social coalescences (assemblages) that are formed around the *Cubed* art & digital technology project. *Cubed* creates playful engagements with and between its participants and in so doing enables the conceptualising of new notions of play, art and technology that emerge through these activities.

This thesis develops existing philosophical concepts of technic and technicity, and creates a novel understanding of these ideas. The performative knowledge described in this thesis is an operation that uses *Cubed* as an object to think with, in order to bring being and thought into a co-determinate relationship, one that comes about in a transductive relation, through their mutual co-individuation.

The engagement between *Cubed* and its participants is haptic; its system is autopoietic; and its aesthetic is that of a 'Nomadic Play Machine', this play deterritorializes existing spatial determinations, and develops new subjectivities through the resonance of its refrain. Taken as a cybernetic whole these interactions form an ecology, a complex web of reflexive relationships, heterogeneous assemblages of relations. *Cubed* diagrams ludic engagement, and in so doing develops lines of flight, away from existing spatial, physical and psychological formations in order to create new openings onto the virtual. *Cubed* substitutes the hylomorphism of the substantive form / matter coupling with a creative modulation that expresses the processual sense of individuation as transduction. This process aids the articulation of an analogic, ontological knowledge, that expresses distinctive ludic planes, and this phenomenon is articulated diagrammatically

"There have been two capital events in the course of human history: the making of tools (with which work was born); the making of art objects (with which play began) … The birth of art has its obvious connections with the prior existence. Not only requiring the possession of tools and some acquired skill in fashioning and handling them, art had in relation to utilitarian activity an opposite importance or value; it was a kind of protest against the hitherto existing world … itself indispensable to articulating the protest … At its outset art was primarily a game. In a major sense it still is."

Georges Bataille (1955:27)



Cubed. Image Giles Askham

Cubed – Abandon Normal Devices Festival (2010) Grizedale Forest Park, Cumbria. In Colour Cube, and Treasure Hunt modes. Images Giles Askham

Cubed documentation available at www.cubed-3.org

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## Research Objectives

This research project will develop existing philosophical concepts of technic, and technicity.

This research project will explore the techno-social coalescences (assemblages) that are formed around my Art & Technology projects and their audiences (recipients).

A practice-led approach to framing these engagements enables this research to diagram these assemblages. These novel distributions of content and expression will lead to the conceptualisation of new notions of art, play and technology that emerge through these activities.

In such ways this research will enhance our understandings of the relationships between humans and technology.

## Introduction

This research develops a technical object: *Cubed;* and taking Simondon's (1958, 1964) and De Certeau's (1984) philosophical lead, cognises its futurity both as a modality and as a transindividual operation that exist at the heart of its technical assemblage. Simondon's notion of the transindividual, describes a unity of two relations and as such is a relation of relations. These two mutually reciprocal processes, modality and operation, in their translational relation being an emergent process: a disparation, a transductive becoming. The writing on *Cubed* presented here will be situated within my wider Art practice. This work, that has occurred over an extended period of time, has sought to explore notions of play and provide opportunities for playful engagements both with and between audience members. As an object to think with the processual individuations, instantiated by *Cubed* will enable after Simondon (1958) the production of a metastable analogic knowledge.

Commissioned by Folly as part of its Portable Pixel Playground (PPP) project, *Cubed* is an interactive art project as defined by Katja Kwastek (2013:262) as "a manifest entity, invitation to act, and basis for performance" which calls out to be activated by its audience. The remit of Folly's Portable Pixel Playground project was to work with new audiences, and to explore how we make sense of the world through art and technology. Its expressed purpose was to produce "A unique and imaginative environment that offers children and young people alternative play opportunities with art and technology" (Folly 2009). Candy (2020:179-180) argues that emerging forms of digitally amplified practice are breaking new ground and "Inevitably this practice becomes a research process when innovation in the art and the technology are closely intertwined" The organisation of relations of Human Computer interactions and territorial arrangements are the mode of existence of

*Cubed*. This intertwining is suffused with potential. For Simondon (1958) the Technical Object is not the other of the human, nor is it primarily a tool to be instrumentalised, instead it contains something of the human. This is "the charge of nature conserved with individual being, and which contains potentials and virtuality" (1958: 249). The charge from which transductive unity is organised in its individuation, enables the futurity of *Cubed* to become a possibility.

In Simondon's philosophy, ideas of substance, form, and matter are replaced by the more fundamental concepts of: reticularity**,** initial information, internal resonance, metastability, energy potential, and orders of magnitude. Simondon (1964) argues that the teleological nature of technical culture has infected philosophy with hylomorphism, in its place he makes a conceptual shift and transforms the philosophical paradigm by developing his analogic method. Simondon moves beyond a description based on means, that presents a schema of utility suited only to an account of the tool. Characterising technicity in terms of its ontogeniety enables him and us to make a radical break, and this is the approach I will take to the study of my own arts practice.

This research project creates (after Simondon) an amplifying network, a technic's that is faithful to the nature of beings. It enables the relation of humans to technology and to one another to be reinvented through the nondialectical nonalienating disparate relation of play. The analogical method it develops aids our understanding of the ontogenesis of *Cubed*, in the putting into relation of technical and social/ psychic operations. This ethical methodology provides knowledge of structures from the perspective of the operations that animate them.

The modulation that *Cubed* sets up between forces (of play) and materials (of the technical) opens the art machine that it is, up to experimentation, rather than

interpretation. This ‘amplifying operation’ (Sauvagnargues 2016:63), is an inventive construction that after Simondon (1958) is problematically a creative disparity. *Cubed* creates its own milieu of individuation, and after Sauvagnargues (2016:65). “causes sensibility and thought to emerge as a resolution of a difference of potential, that is as intensive difference”.

**Cubed – Making / Playing**

Thomas LaMarre (2013:108) contends that the essence of the human lies in technical equality; the relation between efficient causality and final causality. For him Simondon’s (1958, 1964) work explores the constitution of beings from the point of view of their individuation. There is no duality of humans and machines, but they are ontologically different, and each should be described in their ontogenetic becoming. In looking at the individuation of the individual Simondon (1964) is considering its underlying energetics, its dephasing. In Simondon’s work the neutral point of the human, from which our potential bursts forth, consists of our ability to be both the agent of change and to purposefully make those changes.

At different moments in the life of the project *Cubed* brings diverse elements into specific alignment forming a network which harboured a set of incompatible potentials. These elements connected in particular articulations, causally effected mutations upon the network, and reformed it in new configurations. *Cubed*, in its genesis being an actualised metastable system, which can be described as a partial solution to the problems of incompatibility between these elements; becoming through processes of transduction, in the processual sense of its individuation, dephasing these elements separate levels of being.

**Cubed – Making**

The mode of relation of *Cubed* to the technical object articulates these relations in new ways. Beginning as an idea that developed from a particular knowledge and understanding possessed by me (knowledge of art, technology, and play), the abstract Technical Object that was *Cubed* at its emergence required a "physical translation of an intellectual system." (Simondon 1958:40) This translation necessitating the folding of other, technical principles (hardware/ software) into the *Cubed* assemblage, via the particular knowledge and understanding (programming/ electronics) possessed by Luke Hastilow. The connection of each of these principles coming about only through their convergence in the internal coherence of the *Cubed* assemblage, in its existence as a concrete Technical Object. *Cubed* in it's becoming, being its own efficient causality.

**Cubed – Playing**

*Cubed* provides opportunities for the performance of an 'everyday practice' (De Certeau 1984) – in its particular instantiation the practice of play. It enables the enunciation of a tactical place and the performance of an anti-discipline, contra the generalized structuring of strategic space that is the mark of the Surveillance Society. *Cubed* offers opportunities of resistance, and affords tactics for the avoidance of being reduced by De Certeau's (1984:32) "primarily regulatory field of technocratic rationality" to a mode of merely passive subjectivity. In its genesis as a system *Cubed* seeks to bring about the emergence of transindividual. A neutral point containing the germ of preindividual potential in the milieu of play: *Cubed* possesses an energetic, charged potentiality. In its futurity *Cubed* points towards an amplifying network that is as yet un-invented. *Cubed* enables a distributed network of relations

between heterogenous elements of different types and kind: both human and technical. These elements undergo translations in their relationships of coupling and articulations in and through the *Cubed* technical assemblage. The system is designed to be played with. It is also designed to facilitate, store, and share new games invented by its players. Ontongenetic in its organisation, its users are able to shape is future functionality. *Cubed* in it's becoming, being its own final cause.

Playful, engagements can be non-alienating and take the form of the refrain (Deleuze and Guattari 1988), setting up relations that can be described as disparations, between and across biological, social, and technical domains. Such domains become territorialised (deterritorialised, and reterritorialized in Deleuze and Guattari's 1998 terms) and enable the formation of new assemblages and subjectivities just as these domains themselves modulate and re-organise. Being can be described as a refrain (Deleuze and Guattari 1988), a relation with aesthetic and transformational potential. For Anne Sauvagnargues (2016:125) The refrain "unleashes spatiotemporal rhythm and measure in an aesthetic and sensory mode, as habit, habitation, and habituation".

*Cubed* problematises human technical relations. As a closely coupled network it articulates the human and the technical in the relation of play. Combes (2013:70-78) reminds us that for Simondon it is in the nature of work (and not only under the condition of Capitalism) to alienate and exploit. In this regard I posit the notion of play, contra work, as a non-alienating activity. *Cubed* enacts play as operative relation, as a set of non-dialectical potentials that at once both ground and exceed the system and its players. Much contemporary digital technology predicts our future based on previous moves, utilising the 'behavioural surplus' (Zuboff, 2019) of our digital behaviour; the future seen this way is never truly novel. Futurity:

the possible, potential, or virtual future enabled by *Cubed* is different. As an open platform the relation of *Cubed* to its' users is open to mutation, and its connections articulated through its becoming are various and variable. The novelty of this project emerging as a production, and a "construction of concepts formulating new problems" (Sauvagnargues 2016:43).

Combes (2013:70) maintains that Simondon understands labour as the origin of the hylomorphic schema. She argues that his work posits that this schema – a technical operation drawn from labour – has been transposed into philosophical thought and taken as the universal paradigm for the genesis of being. The first chapter of this thesis carefully examines the effect of the transposition of instrumentalised technology into thinking, and seeks to cognise our relation to technology differently.

## Chapter One – Technology

Whilst our contemporary word technology defines the application of scientific knowledge for practical purposes, the etymology of the term lies in the Ancient Greek designation technē; a word with multiple meanings and one that is used to describe both art and craft. Technē makes no distinction between industrial production and fine art, it does however describe the human process of making. Aristotle (2002:181) defined technē as "a state of capacity to produce with a true logos". Defined by the utilisation of logos, an application of reason, Aristotle bestowed knowledge upon both art and industry, and in so doing opposed this to common belief, the mere opinion of doxa. For Auyang (2004: vii) our conception of modern technology grew out of this earlier definition and as such it remains a notion that is intrinsically linked with human activity.

In *Engineering – An Endless Frontier* Auyang (2004), traces the beginnings of a divide in the history of technology starting from Roman times during which technology becomes a systematic treatment, and technē and logos become ambiguously concatenated. One view posits technology as a systematic discourse about practical art, logos belonging to scholars who take practical art as their topic of investigation, (today such studies might be called technology studies, rather than technology, for instance: Gilbert Simondon's Mechanology, or Bruno Latour's Technoscience, which are both discussed later). The alternative view posits technology as the systematic reasoning of practical art itself. While art and reasoning exist as interwoven potentials, technology becomes "the systematic abstraction of essentials; the articulation, generalization, refinement, and development of knowledge involved in productive and creative activities. Thus practical art –

engineering and technology – become scientific not by imitation but by self development" Auyang (2004: vii).

Such an underpinning thus provides the foundation for Enlightenment rationality, scientific study, and technological development. For Auyang it was further taken up in the Nineteenth Century with two additional connotations. For Anthropologists and Historians technology embraces all practical arts, while for engineers and scientist's technology is only concerned with those practical arts that "incorporate a significant body of explicitly articulated knowledge and explanation that is scientific in the modern sense" (Auyang 2004: vii). Both senses of the term are commonly used today, and technology is regarded as a capacity to produce and create. While contemporary usage of the word technology is broadly applied, the ancient term technē has been used by scholars to distinguish their thoughts from this sometimes coarsely applied conception, and to seek an appreciation of our relation to technology that goes beyond a merely instrumental, ends-to-a-means understanding.

In *Traditional Language and Technological Language* Martin Heidegger (1962) frames important research questions around the subject of technology, that are still pertinent to the discussion today. In it he argues that the anthropological-instrumental conception of modern technology is correct, but not true. For him it does not capture what is most peculiar to technology: the demand to challenge nature. For Heidegger any attempt to reflect on what 'technology', 'language', and 'tradition' are in themselves is something of an over determination; what is required is to rethink current conceptions of these terms. For Heidegger: "technology – correctly understood – reigns throughout the whole realm of our reflection" (Heidegger 1962:132). For him modern technology is viewed as something human, invented, developed and controlled by humans for humans, and it is difficult for us

to think beyond this formation. This, the anthropological conception of technology, establishes what Heidegger calls the instrumental moment.

> "The Latin verb instruere means: to heap on one another, to build, to order, to install properly. The instrumentum is the tool and implement the aid and means of conveyance – means in general. Technology is seen as something with which humans handle what they have the intention of putting to use" (Heidegger 1962:134).

The anthropological-instrumental conception is correct, and permeates all of our thinking, but Heidegger argues that this does not make it true. How then to rethink the current conception of modern technology? Heidegger argues that the word technology derives from the Greek for that which belongs, which also means to be in command of something. "The character of knowing resides, according to the Greek experience, in the unlocking of, making manifest, what is presented as something present." (Heidegger 1962:135)

For Heidegger (1962) at its root technology is not of making, but of knowledge, and as such technology now asks that its own kind of knowledge be developed, as soon as a science corresponding to it appears. Heidegger asserts that this has happened only once, in Europe at the beginning of the epoch of modernity, and from this moment technology and science are now co-determinants of knowing. With this new articulation the question now becomes "How must nature be projected in advance as a region of objects so that natural processes are made calculable in advance?" (Heidegger 1962:136). Heidegger contends that this happens in two ways: firstly, concerning the character of the reality of nature, only what is calculable in

advance counts as being; and secondly, method is prioritised in asking the question, the advance against what? As such “What is peculiar to technology resides in the fact that, in it, the demand speaks forth, the demand to challenge nature forth into placing it at our disposal and securing it as natural energy” (Heidegger 1962:137).

In his introduction to Martin Heidegger’s *The Question concerning Technology* (1977) William Lovitt argues that Heidegger’s philosophy describes a manifold reality in which different aspects encroach upon one another. While movements and interactions need to be recounted, they always involve a complex unity. Lovitt points out that Heidegger (1977) saw the ancient Greek reality as one in which men were immediately responsive to whatever was 'presencing' to them. In Ancient Greece technē was a skilled and thorough knowing that disclosed, that was a mode of bringing-forth into presencing, a mode of revealing. By returning to the Greek root technē Heidegger blurs distinctions between art, technology and technique.

Philosophy for Heidegger (1977) was also a technē, the metaphysical thinking that sprung from the Ancient Greek philosophy carried forward the expression of technē into modern times, and furthermore is read by Heidegger as the completion of the project of metaphysics. Lovitt points out that for Heidegger (1977) cogito ergo sum allows Descartes’ man to represent reality to himself as an object of thought. He becomes secure in his own existence and in the existence of the reality conceived by it. Heidegger (1977) sees this moment as the beginning of the modern age: metaphysics' tendency to put man at the determining centre of reality, and also to be a subject of it. Descartes reality exists in man’s consciousness of it, human consciousness becomes the subject par excellence, and modern science for Heidegger (1977) is the work of man as subject.

In questioning technology Heidegger (1977) sought a way of thinking that moved beyond instrumental and anthropological conceptions. He sought a route that would open up human existence to the 'enduring essence of technology' an essence that for him in itself is not technological. Modern instrumental conceptions of technology that posit it as a means to an end, condition any attempt to bring man into a 'right' relation to technology. For Heidegger (1977) in order to reveal the truth of this relation, an 'uncovering' needs to take place.

In order to achieve this ‘uncovering’ the question becomes: “What is the instrumental itself? Within what do such things as means and ends belong? … Wherever ends are pursued and means are employed, wherever instrumentality reigns, there reigns causality” (Heidegger 1977:6). For Heidegger (1977) what technology is when represented as a means is disclosed in tracing instrumentality back to fourfold causality: causa materialis, causa formalis, causa finalis, and causa efficiens. Cause has long been represented as that which brings something about. Causa efficiens, while it is but one of the four causes, has been used to set the standard for all causality. For Heidegger Telos, (which he argues has been mistranslated as aim or purpose) is that which gives bounds, which completes, out of which the 'thing' (an object, the what) begins to be what it is. Telos is responsible for what as matter and for what as aspect are together co-responsible for an object.

To illustrate his point Heidegger (1977) uses the example of the silversmith and the sacrificial vessel. For him both the silver as the material with which to form the chalice, and the aspect in which the silver is formed, are each co-responsible for the sacrificial vessel. The silver mater out of which the chalice is made provides the causa materialis. The shape or form into which the material enters is the causa formalis. The end to which the object is put, the sacrificial rite for which the chalice

is required is the causa finalis.  For Heidegger, the silversmith is not only that which brings about the end, the causa efficiens, but instead, carefully considers and gathers together the other ways of being responsible. While the four ways differ, they do belong together and from the beginning are united. “The four ways of being responsible bring something into appearance. They let it come forth into presencing. They set it free to that place and so start it on its way, namely, into its complete arrival … being responsible is an occasioning or an inducing to go forward” (Heidegger 1977:9).

For Heidegger (1977) ‘occasion’ is the name for the essence of causality, thought as the Greeks thought it. Bringing forth furthermore is a poiēsis, which can be expressed as handicraft, artistic and poetic bringing into appearance, as well as manufacturing. The four modes of occasioning are at play in bringing-forth. Every bringing-forth is grounded in revealing, a bringing-forth from concealment into 'unconcealment'. “If we inquire step by step, into what technology, represented as means, actually is, then we shall arrive at revealing. The possibility of all productive manufacturing lies in revealing.” (Heidegger 1977:9) Technē thus belongs to bringing-forth, to poiēsis, it is poetic. Technē encompasses (for Heidegger it enframes) the activities and skills of the craftsman but also the arts of the mind and the fine arts.

Heidegger may be criticised for using technē as an overarching term, making any meaning it might provide difficult to grasp, and problematic to apply: “There was a time when it was not technology alone that bore the name technē. Once that revealing that brings forth truth into the splendor of radiant appearing also was called technē” (Heidegger 1977:34). He has also been criticised for an unsophisticated Aristotelian hylomorphism (for instance by both Latour 1991 and Stiegler 1998) but

his work does seek to look beyond the instrumental conception of technology, a notion that all too often obscures a fuller understanding of the interrelations between the human and the technological.

For Heidegger (1977), it is because modern technology is a means to an end that the instrumental conception of technology conditions every attempt to understand it, and what is more, our will to master it becomes all the more urgent the more it threatens to slip from our control. He sees modern technology as a challenge to nature: “Agriculture is now the mechanised food industry. Air is now set upon to yield nitrogen, the earth ore to yield uranium” (Heidegger1977:15).

The revealing through modern technology is the unlocking of the energy concealed in nature, it is then transformed, stored, and distributed. This expedition is always directed towards furthering something else: essentially maximum yield at minimum expense. It would seem that Heidegger is also developing Ancient Greek notions of the word 'machine' the etymology of which is mēkhanē, which has a similar meaning as the word machination, to have power over, which has been interpreted as meaning a “trick against nature” (Hart 1980).

For Heidegger (1977) Man responds to the call of ‘unconcealment’, his investigations and categorisations of nature ensnare nature as an object of his research. Everywhere, everything is ordered to stand by, to be immediately at hand. Heidegger's 'standing-reserve' is designated as the way any object reveals itself to the challenging revealing. He uses the example of an airliner. In standing on the taxi strip only as standing-reserve it is “ordered to ensure the possibility of transportation. For this it must be in its whole structure, and in every one of its constituent parts on call for duty, i.e., ready for take-off.” (Heidegger 1977:17)

For Heidegger (1977) then modern technology reveals the real as standing reserve, which is neither a human activity nor a mere means within it. Modern science sets nature up to exhibit itself as consisting of what Heidegger (1977:18) calls 'forces in coherence'. These forces can be calculated in advance, and are used to order sciences experiments: specifically, and precisely, for the purpose of asking whether and how nature reports itself when set up in this way. Heidegger (1977:19) sees modern physics as the herald of 'Ge-stell' – 'Enframing', an assembling and ordering. Enframing for him is a 'challenging claim' which gathers man to order, the "self-revealing of the standing reserve" (Heidegger 1977:20).

For Heidegger (1977) enframing is a revealing that conditions the essence of modern science, technology, and the world. The essence of enframing however is not in itself technological. The system is determined by a causality that has changed. It no longer displays the character of the occasioning that brings forth, nor the nature of the causa efficiens, or causa formalis. It has been reduced to a reporting – a reporting challenged forth – of standing reserves that must be guaranteed either simultaneously or in sequence. Man stands within the essential realm of Enframing. He cannot form a relationship with technology that is subsequent to it. For Heidegger (1977), to ask how we arrive at a relationship to the essence of technology comes too late.

Heidegger (1977), argues that it is through close phenomenological examination that enframing is revealed, in considering the essence of technology we experience enframing as a 'destining of revealing.' This destining starts man on a way of revealing, the path of science and technology is continually on the edge of possibility, but it pushes forward only that which is revealed in ordering. For Heidegger (1977) this blocks the other possibility – that man might be admitted more

primally to the essence of what is unconcealed and to its unconcealment, in order to experience as his essence, his needed belonging to revealing. Making a tacit critique of verum factum essentialism Heidegger (1977) argues that man, threatened by his destining, exalts himself as lord of the earth, and the impression comes to prevail that everything he encounters exists only insofar as it is his construct. The final delusion is that man only ever encounters himself. “Man stands so decisively in attendance on the challenging-forth of Enframing that he fails to see himself as the one spoken to” (Heidegger 1977:27).

Heidegger's conception of technology has been criticised as anti-modern, and as revealing a longing for a return to pre-mechanised relations[1] in which we retain a personal and physical relation with our objects and remain in control of the tools we use to fashion them. Many of the examples that he uses in The Question Concerning Technology (such as silversmithing), and elsewhere (for instance: handmade wooden clogs in The Origin of the Work of Art, 1960) can be cited in support of such a claim. While it is difficult to refute these criticisms, Heidegger's notion of Enframing, a central tenant of his thinking, has provided a crucial touchstone for subsequent thinkers and still has a critical currency today.

Heidegger's phenomenological method examines Being as being constituted in all knowledge, and in every relation to itself: Dasein is this ontological Being of beings. The fundamental ontological task of the interpretation of Being includes the elaboration of the temporality of Being, it is historically based and is also aware of its own finitude. Heidegger's essence of technology is the mode of Beings revealing of itself that holds sway over all the phenomena of the modern age. Man stands

[1] A notable and particularly caustic example being that of Bruno Latour in *We Have Never Been Modern* (1991:66)

within the essential realm of Enframing. He cannot form a relationship with technology that is subsequent to it. For Heidegger (1977) to ask how we arrive at a relationship to the essence of technology is too late an instance from which to approach this question.

Heidegger's notion of arriving too late at a conception of technology resonates with writing that explores temporal, evolutionary and epiphiloegenetic dimensions of the relationships between the technological and the human and is developed in the work of: Graham Harman, Adrian Mackenzie, and Bernard Stiegler, among others.

Tom Rockmore (1995) argues that although technology is central to Heidegger's thought, in The Question Concerning Technology he conflates modern technology and modern metaphysics and furthermore; "In order to grasp the essence of metaphysics, he believes we need to connect technology to truth as found in the ancient Greek view of techne" (Rockmore 1995:133). For Rockmore then the link between technē and technology is not merely etymological, it is essential: both are elements in the history of metaphysics, which itself belongs to the history of Being. Instead of adopting the ancient word technē to explore the condition of our relation to technology, a different term that has been applied is technicity.

Technicity is a concept that has been used by: Bertrand Gille, André Leroi-Gourhan, Gilbert Simondon, Bruno Latour, Brian Massumi, Bernard Stiegler, Adrian Mackenzie, and Graham Harman, among others. Leroi-Gourhan (1993) argues that technology and biology diverged from the historical period of the upper Paleolithic. "The volume of the human brain has apparently reached its peak, and the (lithic) industry curve, on the contrary, is at the start of its vertical ascent ... Human cultural development begins to be dominated by social phenomena." (Leroi-Gourhan,

1993:144). The larger range of tools seen during this period is for Leroi-Gourhan the product of cultural diversification. This is now the main regulating factor in the development of Homo Sapiens.

From Neolithic indirect mobility whereby the hand operates machines, and supplies them with power, we can draw a line to the present day where finally the hand is used to set programmed processes in automated machines. Tools, gestures and mobility are thus exteriorised and the effects of these spill over into memory and mechanical behaviour. “This enmeshing of tools and gestures in organs extraneous to the human has all the characteristics of biological evolution because, like cerebral evolution, it develops in time through the addition of elements that improve the operational process without eliminating one another” (Leroi-Gourhan, 1993:242).

Just as the human brain preserves all the developmental stages acquired since the Paleozoic fish, with each stage playing a role, each new stage overlaying the last; the automatic machine similarly contains within it all previous technicity. From Leroi-Gourhan (1993) we take the concept that humans and technology are mutually constitutive of one another, and that technological development is a continuation of an evolution that began as a biological process, and one that lately became sociological. “Whereas the base on which we stand is and must remain the osteomuscular system of the last stage of the animal world, the superstructure is wholly artificial and imaginary, born of the interaction taking place externally between the two poles of the creative activity – the face and the hand – in technics and in language.” (Leroi-Gourhan 1993:402). These are themes that are further developed in the writing of others including: Bertrand Gille, Gilbert Simondon, Gilles Deleuze & Félix Guattari, and Bernard Stiegler.

For Brian Massumi (2009) our present condition of accelerated technological change has brought about a renewal of interest in scientific modes of knowledge and their relation to the human condition, “The question of technology was now directly a question of the constitution of being – in a word, ontology. Or more precisely: because given the juncture, the question of being had to be approached from the angle of becoming; it was a question of ontogenesis.” (Massumi 2009:37)

Massumi, among many others posits Gilbert Simondon's work as providing a way to approach these questions. Like Leroi-Gourhan, Simondon (1958) posits technological innovation as the key theatre of thought that comes about in the becoming of matter, in ways that overlap with biological transformations in life. Massumi argues that Simondon's concept of technical mentality has incredibly contemporary resonance and that it links the question of the nature of technical objects to the evolution of the network. Simondon's notion of the technical object, which evolves through the network into a post-industrial 'open object', for Massumi (2009) neatly frames the discussion that is comprehensively relevant to today's critical thought.

Simondon's (1958) *On the Mode of Existence of Technical Objects* provides a very real departure from previous writing on the subject of technology and technicity. Simondon's work is arranged in three sections. *Part I, The Genesis and Evolution of Technical Objects* looks at reality from a machine perspective. *Part II, Man and the Technical Object* questions what information is, the nature of progress, the meaning of automation, and the scientific application of thermodynamics; before exploring the relationship between man and machine. *Part III, The Genesis of Technicality* presents Simondon's machine philosophy. In his preface to the 1958 Paris edition John Hart argues that in this section Simondon is describing nothing

less than the existential situation of machines, and the condition of their becoming arising out of the relationship between humanity and the world.

Simondon begins *On the Mode of Existence of Technical Objects* (1958) with the statement that there is no foundation to the opposition of man and machine. He argues that technical objects are mediators between man and nature and although the machine is a stranger to us, what is locked into it is human. “Culture fails to take into account that in technical reality there is human reality... Recognition of the modes of existence of Technical Objects must be the result of philosophical consideration” (Simondon 1958:11). It is therefore necessary to regain an understanding of the nature of machines and their relationships with the human. For Simondon (1958), the work of the technologist or mechanologist – whose efforts develops this knowledge – should be viewed as being as important as that of the psychologist or the sociologist.

In his introduction Simondon (1958) defines the technical object in and of itself. Using the term concretization, he describes the technical object from the point of view of it as the end-product of an evolution and not as a mere utensil. He argues that the modalities of this genesis make possible an understanding of the three levels of the technical object and what he calls their “temporal, non-dialectic coordination” (1958:15). These levels are that of: the element, the individual, and the ensemble.

Once a technical object has been defined in its evolution, it is then possible to study the relationship between any given technical object and other coexistent realities. Simondon (1958) considers technology from different historical periods, and argues that depending on the technical object’s evolutionary situation as either: element, individual or ensemble; very different attitudes arise to it. He contrasts improvements to Eighteenth Century technical elements. This period, which saw a

pervasive climate of optimism, can be characterised by notions of endless progress, with different attitudes to distinctive phases of technical evolution. For Simondon (1958), when the machine at a certain level of automation becomes individual, it also becomes our adversary. The machine takes the place of man as tool bearer and nature is despoiled. There is a ‘will for power’ expressed in the excesses of the Nineteenth Century thermodynamic era and at the same time a Luddite reaction to this technological step change. Simondon (1958) classifies new developments of the Twentieth Century in terms of technical ensemble's; a period which saw information theory replace thermodynamic's, in which the machine becomes the tool “which augments the quality of information” (Simondon 1958:16). Simondon argues that information theory increases negentropy, fights against the death of the universe, and has a stabilising effect.

For Simondon (1958), when we reach the level of the technical ensemble, technical reality has become regulatory, and it can now be integrated into culture; which, he argues is essentially regulatory in nature. The technical is now part of culture “technicality tends to reside in ensembles. For this reason, it can become a foundation for culture, to which it will bring a unifying and stabilizing power, making culture respond to the reality which it expresses and which it governs” (Simondon 1958:16-17).

In chapter one: The Genesis and Evolution of Technical Objects Simondon (1958) argues that every technical object undergoes a genesis, but these are individual processes that are difficult to define as they are processes which modify each technical object’s individuality. In addition to this there is no fixed structure that corresponds to a defined use. Different objects can carry out the same functions;

Simondon (1958) gives the example of steam and petrol engines. The categorising of technical objects into 'species' as such then is not helpful.

For Simondon (1958) it is through usage, the process of the coupling of the object to the human that heterogeneous structures and functions are brought together and attain meaning. A word like 'machine' therefore cannot be used for instance, as a proper noun, because a technical object like the machine can be multiple in itself, and can also vary over time, changing its individuality. A more useful approach for Simondon (1958) would be to start with the criteria of the object's genesis, from which can be defined its individual autonomous existence. It starts to become clear that Simondon (1958) assigns technical objects a particular agency, and for him "The technical object is a unit of becoming" (Simondon 1958:19).

For Simondon (1958) everything, including technical objects, are in a process of evolving. "The technical being evolves by convergence and by adaption to itself; it is unified from within according to a principle of internal resonance" (Simondon 1958:19). This evolution inscribes diverse functional elements into closely coupled assemblages, moving from the abstract to the concrete, a situation in which the technical object becomes a unified coherent system. Simondon (1958) cites the example of the engine block where gill-ribs are used to cool and give structural strength. Over time these evolve, changing in: shape, size, alignment and material; the block internally resonating with itself to become more powerful and efficient. This evolution of technical objects develops into a small number of types stemming from internal necessity, and making the production line possible. Simondon (1958) argues that this is the formation of stable types. "The technical object exists, then, as a specific type that is arrived at the end of a convergent series. This series goes from the abstract mode to the concrete mode: it tends towards a state at which the

technical being becomes a system that is entirely coherent with itself and entirely unified" (Simondon 1958:21).

Scientific knowledge is not able to precisely forecast all the effects of the evolution and concretization of technical objects. "The scientific object is never completely known. For this reason it is never completely concrete either" (Simondon 1958:31). Simondon's writing seems to provide an ontogenetic theory of knowledge: where new understanding is developed through active processes. He discerns families of technical objects and describes processes of natural technical evolution. The gas engine is cited as the forefather of the petrol and diesel engine. For Simondon (1958), every series begins with a 'synergetic invention' based on a 'technical essence'. The gas engines cylinder for instance is an explosion chamber that combines the earlier steam engines boiler and furnace, and as such a process occurs where combustion is internalised.

These concrete technical objects provide the evidence of a mode of functioning that clearly exists but which was unknown prior to their construction. Any compatibility within their system did not exist in any of the previous technical knowledge from which they were made, it is rather through their construction that it is discovered. What we have here is no less than an ontogenetic becoming.

Simondon (1958) argues that once a new mode of functioning exists, the root to its 'issuing forth' can be traced back through the distinct knowledges that correlate in its compatible existence. In an approach that would seem to be the opposite to the one taken by Heidegger (1977), these new modes, that are not illustrative of previous individual principles, evidentially exist before being foreseen. Such a technique provides the foundation for "a science of correlations and transformations, a general science of technology or mechanology" (Simondon 1958:42). Such a science ought

to take as its subject the universality of technical objects. For Simondon (1958) this is the major issue with cybernetics. While it provided us with what he sees as the first inductive study of technical objects, its field was too precise. As a first principle, it classified in terms of genus and species. For Simondon (1958), there is no species of automata, what must happen is that technical objects must be studied in their evolution. It is from here that their process of concretisation can be extracted and studied.

> "Instead of considering one class of technical beings, automata, we should follow the lines of concretization throughout the temporal evolution of technical objects. This is the only approach that gives real signification, all mythology apart, to the bringing together of living being and technical object" (Simondon 1958:42).

The technical object provides a double articulation, where two environments come together. It becomes "paired energetically with its milieu" (Simondon 1958:45) and should be simultaneously integrated into each milieu. These environments are however separate and not necessarily compatible. Electric trains for instance, are sustained by the double relationship between their technical and geographical environments. Silicon insulators make possible a greater 'augmentation in heat', increasing the possibilities of running very high voltage, increasing starting and breaking torque. Modifications such as these extend rather than restrict the field of use for trains.

Perhaps Simondon's most eloquent example of the close coupling of a machine with its milieu is the Guimbal turbine, the first example of a turbine housed

in a water pipe, in which the water becomes 'plurifunctional'. In supplying the energy that activates the turbine and the generator, it also removes excess heat produced by the generator. Oil in the system also has multiple functions. It lubricates the generator, insulates the gears, and conducts heat from the gears to the housing. For Simondon (1958:48) "…concretisation is effected by an invention which supposes the problem solved". Furthermore this process causes the birth of a new environment: an environment that prior to the invention was virtual and not real. The technical object is thus "...the condition of itself as a condition for the existence of this mixed environment that is at once technical and geographical" (Simondon 1958:48). A particular situation, an environment closely coupled to a technical object causes its own concretising genesis, creates the singularity of its existence and calls it into being from the virtual, this being prior to it having any 'real' existence. In a very major departure from others such as Leroi-Gourhan (1993), Gille (1986), and Heidegger (1977), Simondon's (1958) work questions the very notion of temporal linearity.

For Simondon (1958), technical objects can only evolve freely if they do not become subject to any hypertelic or specialised necessity (what he calls a condition of disadaptation). For him this evolution should therefore lead towards the creation of a new 'technogeographical environment' in which every modification is self-conditioned. The technical object is the state of its own possibility. It is causality in the environment, which the technical object creates around itself, that enables this process. In what might at first appear to be something of a circular argument, the environment is both influenced by and has influence over the technical object. For Simondon though, this environment is a combination of both the natural elements that surround the technical object and also the specific elements that constitute it. It

is this 'associated milieu' that conditions the technical object's operation. Brian Massumi (2009) argues that:

> "What matters for Simondon is the paradox that before the oil and the water entered into relation, the respective multifunctionalities were not in effect. They were nowhere. They are not to be found in the past. It is when the relation kicked in that they were determined, by that very event, to have been the potential for what has come. If the potential was not effectively there in the past, there is only one place it could have come from: the future… Invention is the bringing into present operation of future functions that potentialize the present for an energetic leap into the new. The effect is a product of a recursive causality: an action of the future on the present" (Massumi 2009)

Such objects – which Simondon (1958) argues are the cause of their own condition of functioning – for Massumi (2009) must be invented rather than developed in stages. They are objects from the future which condition the present, and as such require creative imagination. Simondon (1958) draws parallels between the dynamism of thought and technical objects, arguing each as having the analogous unity of an associated milieu. "That which is alive can invent, because whatever is alive is an individual being that brings with it its own associated milieu" (Simondon 1958:50). It might then be argued that thinking is an act of invention, a system of possibilities or virtualities that gives existence to forms which then become actualised. Invention is the creation of a new system that opens the actual up to the virtual.

Simondon (1958) describes thought as made up of specific structures, such as representations, memories and perceptions. Thought is the background that provides direction and homeostatic unity. It moves informed energy from one to the other and from all to each. This background is implicit. “New systems of forms are elaborated in it. Without a background of thought, there can be no thinking being” (Simondon 1958:52). It is at this point Simondon begins to relate technical and biological individualization (A theme further explored in his L’individu et sa genèse physico-biologique 1964) For him it is because we are ourselves an 'interplay of relationships' that we are able to create technical objects' that are similarly constructed to us.

> “The individualised technical object is an invented object, one that is a product of the interplay of recurrent causality between life and thought in man. An object that is associated either with life or thought alone is a utensil or tool rather than a technical object. It has no internal consistency, because it has no associated milieu to institute recurrent causality” (Simondon 1958:53)

In On the Mode of Existence of Technical Objects Simondon (1958) seems initially to ascribe an active agency to evolving technical objects, while later he draws parallels between this self-determination and the inventive cognitive processes that he argues are inherently human. These processes seem characteristically comparable to him.

Similar themes to those of Simondon's are explored by Bruno Latour in *Science in Action* (1999), but instead of developing a 'mechanology' Latour describes the field of 'technoscience'. His work posits science and technology as a social enterprise, carried out by human actors arranged in networks. “The word network indicates that resources are concentrated in a few places – the knots and the nodes – which are connected with one another – the links and the mesh: these connections transform the scattered resources into a net that may seem to extend everywhere” (Latour 1999:180). For him science and technology are subsets of the larger field of technoscience. It might be argued that for him technics and science are synonymous.

Like Simondon (1958), Latour (1999) has closely studied developments in engine technology and similarly to Simondon he has traced how the efficiency of a mechanism develops. Unlike Simondon though his focus is less on the evolving qualities of the machine as he is more interested in the transformations they undergo at the hands of the many different people involved in their development. The Diesel engine is an interesting illustration of this point. As Latour (1999) points out, technically, Diesel's engine begins with Carnot's thermodynamics, added to which are his patent and the support of Lord Kelvin. Then the manufacturers MAN Krupp lend a hand, and their designs are further prototyped by other engineers. These linked processes transformed the engine technically, as constant temperature is abandoned as a principle, and pressure becomes the new constant, Diesel sought to reconcile these changes that took place between the theoretical engine and the one being realised.

In what Latour (1999) calls the diffusion model of technoscience, new objects emerge from laboratories, and new beliefs move freely between hands and minds. For him this is a technically and scientifically determinist notion that would

allow Diesels engine to emerge fully formed from some workshop and to corner the market seemingly of its own volition. Latour argues that this established model enables facts to reproduce one another. The diffusion model proposes: nobody shapes science and technology except at its inception, therefor the only reasonable explanation of novelty lies with the initiators, the first men and women of science: “in order to reconcile inertia and novelty the notion of discovery has been invented” (Latour 1999:134).

For Latour (1999), the initiators are merely a few elements in a crowd. No matter how carefully the labels are allocated to the 'winner takes all contest' of the diffusion model. And what is more the model also invents a society, to account for the uneven diffusion of ideas and machines. “In this model society is simply a medium of different resistances through which ideas and machines travel” (Latour 1999:135-6).

As Latour (1999), points out, no black box has inertia, every Diesel engine needs to be maintained. The blacker the box, the more it has to be accompanied by people. The Diesel engine story can be analysed by looking at its changing shape, tied to different people, or by looking at the changing type of people that were linked to it, either enrolled people or enrolling things. Viewed this way the Diesel engine can be described as - using Latour's (1999) term - an 'obligatory passage point', and it may be depicted in terms of what he calls either its ‘sociogram’ or its ‘technogram’.

“Carefully take note that the black box is in between these two systems of alliances, that it is an obligatory passage point that holds the two together and that when it is

successful, it concentrates in itself the largest number of hardest associations, especially if it has been turned into an automaton" (Latour 1999:139).

Latour's (1999) obligatory passage point provides an interesting description of a technical object as a networked node, one that draws power from its connections and associations, in both the social and technoscientific realms, making itself a mandatory prerequisite for future technosocial developments.

In the diffusion model science and technics are opposed to society. Society is made up of different interest groups, which resist, accept or ignore both facts and machines. Against this model Latour (1999) posits an alternative, the translation model. "In the translation model, however no such distinction exists since there are only heterogeneous chains of associations that, from time to time, create obligatory passage points. Let us go further: belief in the existence of a society separated from technoscience is an outcome of the diffusion model … This is how you end up with the idea that there are three spheres of Science, Technology, and Society, where the influence and impact of each on the other have to be studied" (Latour 1999:141).

Disciplines such as sociology have attempted to explain science and technology in terms of the influence of social factors and as such, for Latour (1999:141) "a social or a cultural or an economic determinism is added to the technical". Latour (1999) sees this as the meaning of the term 'the social construction of technology'. For him what is important is an equal consideration of the efforts made to enrol and control both human and non-human resources.

If humans and technology are mutually constitutive of one another, then technicity is originary. Leroi-Gourhan, (1993) realised how important the analysis of a technical process could be when he witnessed Francois Bordes' flint knapping

experiments. “Techniques are at the same time gestures and tools, organized in sequence by a true syntax that gives the operational series both their stability and their flexibility. The operational syntax is generated by memory and is born from the dialogue between the brain and the material realm” (Leroi-Gourhan 1993:234).

In *Technics and Time, 1: The fault of Epimetheus* Bernard Stiegler (1998:49) argues that Leroi-Gourhan's (1993) technical tendency “is organised inorganic matter that transforms itself in time as living matter transforms itself in its interaction with the milieu”. It becomes the interface through which the human enters into a relation with its environment. Stiegler (1998:175-80) reads in Leroi-Gourhan the relation to the original milieu of knapped flint as the context in which selected mutations exert themselves on the cerebral cortex. Stiegler radicalises Leroi-Gourhan's work and describes this process as 'Epiphylogenetic'. That is, a morphogenetic accumulation of individual experience, a new relation between the organism and its environment, a new state of matter. For Stiegler (1998) the individual develops out of three memories: genetic memory; memory of the central nervous system (epigenetic); and techno-logical memory (language and technics amalgamated in exteriorisation). The ‘what’ of the tool invents the ‘who’, just as much as the reverse is true. This is a break with genetic evolution, and becomes the logic of an evolution of what Stiegler (1998) terms the prosthetic supplement. The relation between the tool and the human is transductive: differentiation in tool and cortex are effected one by the other, deformed in an originarily dynamic process. The human is thus invented by technical consciousness. If, for Leroi-Gourhan (1993) the epiphylogenetic structure is engendered by the human subject as it evolves, for Stiegler (1998) it is the evolving object that carries forward this structure, with subsequent effects on human corticalization, intentionality, and our understanding of temporality and memory.

"At the dawn of hominization, that is of corticalization, the epiphylogenetic vector becomes flint as that which conserves the epigenesis; the process of corticalization operates as a reflection of this conservation, which is already, in itself, a reflection" (Stiegler 1998:142). The technical object is embedded in historical ethnic memory. For Stiegler (1998) then, the ability to anticipate presupposes the technical object in that anticipation is already a form of memory that is always already technical.

For Stiegler (1998:7-10) the 'who' is that which anticipates, desires, has agency, thinks and understands; the 'what' is its supplement, its prothesis. The 'who' is nothing without the 'what', the differentiating process of exteriorization, which characterises life in a 'transductive' relation. While the technical system mediates and informs the process of individual adaptation and the evolution of the species, Stiegler (1998) does not wish to imply heredity in his analysis. To aid his argument he posits Gilbert Simondon's (1964) analysis of psychic and collective individuation, as allowing one to conceive of a transductive relation as "an originarily technological constitutivity of temporality" (Stiegler 1998:17).

In *Technical Mentality Revisited* (2009) Brian Massumi, in discussion with Arne De Boever, Alex Murray and Jon Roffe, argues that for Simondon epistemology is a function of ontogenesis: thought as well as matter individuates. Technological innovation is thus a key theatre of thought materialising in matter, becomings that are imbricated with living transformations. In *The Position of the Problem of Ontogenesis* (2009) Gilbert Simondon notes how being as individual has been described in both substantialist and hylomorphic terms. Substantialist in the sense that it consists of a unity founded upon itself, and hylomorphic in the sense that form and matter come together to constitute the creation of being. For Simondon

(2009) both these schemas presuppose an anterior principle of individuation: a kind of reverse ontogenesis, where beginning with the already constituted individual, the conditions of existence are extrapolated out, and back. Simondon (2009) makes use of the term individuation as a principle that is able to explain the characteristics of a given individual without making correlative inferences to other aspects of its being. His is an attempt to reverse these other methods and to know the individual through the processes of individuation rather than the individuation through the individual.

Individuation for Simondon (2009) is a 'primordial operation' a relative reality, a phase of being in which “the individual would then be grasped as a relative reality, a certain phase of being that supposes a preindividual reality” (Simondon 2009:5). In the pre-individual regime, reality is more than unity and identity: it can be expressed as a wave or as a particle, as matter or as energy. Every operation is an individuation that divides and dephases the pre-individual being. This for Simondon (2009) is a quantum reality, energy is exchanged between elementary quantities, and an individuation of energy occurs in the relation between particles as physical individuals. Quantum and wave mechanics could therefore converge and be understood as two ways of expressing the pre-individual.

Simondon (2009) argues that the process of individuation not only creates the individual, but also its’ environment, the milleu with which it is paired. Individuation is one possible, partial and relative solution within a system of potentials, and is an eventuality that encloses within itself particular incompatibilities, creating a metastable structure. “In order to think individuation, being must be considered neither as a substance, nor matter, nor form, but as a system that is charged and supersaturated, above the level of unity, not consisting only of itself” (Simondon 2009:6). For Simondon (2009) the division of being into

phases is becoming: not a framework, but a dimension of being, the resolution of 'initial incompatibility rich in potentials'. Being possesses a transductive unity, it can overflow out of itself, dephase itself. Individuation is not a model it is the becoming of being. In the domain of the living life can be described as a 'perpetuated individuation'.

Life is not only the result of individuation: Simondon (2009) describes it as 'the theatre of individuation'. “The living is both agent and theater of individuation; its becoming is a permanent individuation, or rather, a series of outbreaks of individuation advancing from one metastability to another” (Simondon 2009:8). This occurs on three levels; the physical, the vital and psychic, and the psycho-social.

In Simondons (1958, 1964, 2009) philosophy notions of substance, form, and matter are replaced by the more fundamental ones of initial information, internal resonance, metastability, energy potential, and orders of magnitude. For Simondon (2009:11) transduction is individuation in progress, the process of individuation, while the term ontogenesis designates the actual character of the becoming of being. Simondon (2009) argues that these terms so defined require new methods of analysis and description to make possible a conceptual shift in our understanding.

One such approach is provided by Adrian Mackenzie (2002) in *Transductions: bodies and machines at speed*. In his introduction Mackenzie argues that transduction names the process that occurs as an entity individuates or precipitates in a field of relations and potentials. For him Simondons concept of transduction, “can help frame this question of the 'thinkability' of technology. It both highlights a margin of contingency associated with technological objects and practices within collectives, and clarifies some of the difficulties collectives have in making sense of technical practices” (Mackenzie 2002:3).

For Mackenzie (2002) technology resists reduction to discourse and signification instead tending rather to condition them, while at the same time indeterminacy participates in the constitution of collectives, entailing an openness to the future and the past. Mackenzie (2002) uses the term transduction to designate a process that lies at the heart of technicity, as well as a mode of thought adapted to thinking how collectives are involved. For him, “the hallmark of a transductive process is the intersection and knotting together of diverse realities” (Mackenzie 2002:13).

Mackenzie (2002) develops a deep and fine-grained account of transduction by exploring its possibilities across different time periods and technological implementations, looking at such subjects as stone axes, nuclear bombs, the history of the clock, art and technology projects, and biotechnology. He notes that transducers are technical elements and that the word transduction has a technological meaning in both biology and engineering (Mackenzie 2002:15-27). In electronics transducers convert one form of energy into another, for instance a microphone transduces the vibrations of the sound waves of speech into the electron flow of electrical currents. For transduction to occur then there must be a disparity, a discontinuity or a mismatch within a domain; two forms of potential whose disparity can be modulated. A microphone couples sound waves with electrical currents, transduction is therefore a process whereby a particular disparity is both topologically and temporally restructured across some interface, mediating different organisations of energy. “Transduction arises from the non-simultaneity or metastability of a domain, that is in the fact that it is not fully simultaneous or coincident with itself. Boundaries, singularities and differences underlie

transductions” (Mackenzie 2002:17). Both living and technical things as well as their relations, one with another can be considered transductively.

Mackenzie (2002) seeks to conceptualise technology as conditional, for him transduction points to the productive tension that couples human collectives and non-human forces, it is a notion that focuses on the folding of different forces and elements together as collectives individuate. Technical practices neither form culture nor are they formed by culture. Transductions are eventful articulations between realities on different temporal and corporeal scales, and as such technologies overflow their role as signifiers. For Mackenzie (2002:207) “From a transductive standpoint, 'the human' and the 'non-human' are the provisional outcomes of a collective individuation in progress”. Technicity then for Mackenzie (2002) is a term that offers a way of conceptualising how technical practices are grounded in diverse milieus, and it involves thinking relationally about technical action.

For Simondon (1958, 1964, 2009) transduction is a way to consider the relations that come into existence when the preindividual being individuates itself, both expressing individuation and allowing it to be thought as transindividual.

Mackenzie (2002) uses Simondon's concept of the transindividual to describe Stelarc's *Ping Body* performance. Ping Body is an art project in which the artist connected his body, through a computer network, to other places and people and subjected it to the unpredictable effects of ping data that the network delivered. During the performance it becomes impossible to determine whether the artists gestures are his own, or the products of the technical ensemble that was the work.

Mackenzie concludes from his observation of this performance that: “Insofar as they live, bodies transduce. They are a transductive operation in progress” (Mackenzie 2002:137). In Simondons (1958) formulation the transindividual does not unify individual and society, but appears as a relation interior to the individual (defining its psyche) and exterior to the individual (defining the collective). Mackenzie the transindividual is neither interior nor exterior to a body, but topologically is a continuous folding and unfolding at the limit between what we consider to be inside and outside. For him the term individuation “lets us see how information implies an embodiment of a particular kind: the transindividual” (Mackenzie 2002:138). Bernard Stiegler (2009) similarly understands the importance of Simondon's concept, concluding his *Technics and Time 2* thus:

> “The temporal object is a vortex within a flux – that is, a spiral. All 'consciousness' is itself temporal and consequently awhirl; the vortices by which events are formed appear within this whirling flux of 'consciousness.' … prosthetically supported and synthesized and more broadly, that should not be called 'intersubjectivity' but, as we learned from Simondon, transindividuation” (Stiegler 2009:243).

Another way of describing such processes, which will be examined more closely in the next chapter is as deterritorialisations. In their two Capitalism and Schizophrenia books, *Anti-Oedipus* (1984) and *A Thousand Plateaus* (1988). Deleuze and Guattari discuss at length how deterritorializations and becomings stabilise and destabilise homogeneity. Deleuze and Guattari are aided in this task by

the concepts of many philosophers, among them: Andre Leroi-Gourhan's hand/tool and face/vocalisation couplings, and Gilbert Simondon's transductions.

Transduction is a relation of disparation, between and across biological, social, and technical domains. These domains become territorialised (deterritorialised, and reterritorialized in Deleuze and Guattari's 1998 terms) and form new relations at the same time that these domains themselves modulate and re-organise. The next chapter in this thesis posits the phenomena of play as just such a transductive relation of disparation. Being a refrain (Deleuze and Guattari 1988), a relation with aesthetic and transformational potential.

## Chapter Two – Play

What is play? It is clearly biologically, behaviourally, socially, and psychologically significant, and it is not confined to either humans or their closely related animal species. For Eugene Fink (1974:157) “Mans relationship to the enigmatic 'appearances' of the world of play, to the sphere of the imaginary, is ambiguous. Play is a phenomenon for which we cannot easily find adequate categories.” Amorphously defined conceptually, play has been put to use in many and various schools of thought. Brian Sutton-Smith (1997) highlights this ambiguity. In his writing he cites many examples of assorted and varied play forms, together with the diversity of play scholarship. In utilising the research of many academic disciplines Sutton-Smith describes these forms as rhetorically constructed, each formation emphasising a particular aspect of play, each discipline providing useful insights that help develop our understanding of the phenomenon. He describes this hard-fought knowledge as being gained at the price of the negation of other disciplines; the many insights that they contribute often contradicting one another.

Sutton-Smith points out that sociologists, biologists and educators (e.g., Piaget and Vygotsky) focus on how it is adaptive and study it's contribution to: growth, development and socialisation. Furthermore, he notes that anthropologists pursue the links between play and ritual (e.g., Levi-Strauss, Mead). While in the arts play is seen as a spur to creativity. In western societies it is what children do, but it is largely seen as a diversion for adults, and Psychiatry uses it for diagnosis.

Sutton-Smith cites Johan Huizinga's (1949) *Homo Ludens: A Study of the Play element in Culture* as providing key insights in play scholarship. In the book Huizinga argues that contest has a civilizing effect, and that there is a link between

playful contests and the nature of contest in: politics, the law, scholarship, and the arts. For Sutton-Smith (1997: 79) “The forms of culture arise, he says, in such playful antithesis … From contest (power) comes the development of the social hierarchies (identity) around which the society constructs its values”.

For Huizinga (1949) all play means something, and he famously argued that it is the primary means by which society is constructed, a founding principle no less. “In culture we find play as a given magnitude existing before culture even existed, accompanying it and pervading it from the earliest beginnings” (1949: 22). Saleen and Zimmerman (2004: 31-7) tease apart Huizinga's notion of meaningful play and offer various interpretations of the concept. In Huizinga's writing they argue that play itself can be read as culturally significant, likening it to art or literature, or it can be read as a symbolic act of communication. Furthermore, they point to the fact that when Huizinga's  says, “in play there is something at play which transcends the immediate needs of life and imparts meaning to the action” (Saleen and Zimmerman 1949: 446), that this can be read as either meaning something deeper at play, or as something in motion in play that is transformative. Thus, for Saleen and Zimmerman, Huizinga's questions are complex, (providing them with the major themes for their own writing) and “all of them point to key aspects of play and plays participation in the creation of meaning” (Saleen and Zimmerman 2004: 32).

Conferring onto the play phenomena a particular or inherent meaning has been contested. Roger Caillois (2001), in his critique of Huizinga, saw play as separated and isolated from the rest of life, arguing that it is a free activity entered into voluntarily. For him “Play is an occasion of pure waste: waste of time, energy, ingenuity, skill, and often of money” (Caillois 2001: 6). While questioning what he sees as Huizinga's foundational myth, Caillois developed a very useful categorical

schema (which is still referred to by many writers today) arguing that play is either rule-based, or is an act of make-believe. For him rules in games create fictions – the rules of chess for instance separate the game from real life – and these rules, in critical distinction to Huizinga's argument, turn play into an instrument of culture.

Caillois' (2001) work at diagramming a schema defines games or 'Ludus', (the rules of which have a civilising quality) within the larger domain of play, or 'Paida' (the root word for child, and which describes the power of improvisation, a spontaneous manifestation of instinct). These two terms define one axis of a classification. Another axis describes their affect using the terms: Agôn (Competition), Alea (Change), Mimicry (Simulation), and Ilinx (Vertigo). One might play football and chess, (agôn); a lottery (alea); Hamlet (mimicry); or one might bungee jump to produce in oneself a state of disorientation (ilinx). Each category then has particular affects on a player or players "Agôn is a vindication of personal responsibility; alea is a negation of the will, a surrender to destiny" Caillois (2001:18). Agôn and alea can be read as complimentary opposites, but they both create conditions of equality for players, Caillois (2001) sees them as an attempt to substitute perfect situations for the complexity of life. Ilinx is the Greek term for whirlpool, from which derives ilingos, the Greek word for vertigo.

Building on Caillois' schema Sutton-Smith (1997) describes play as an extremely diverse set of occurrences, as being paradoxical and having many ambiguous meanings. For him these meanings can only be described by taking certain rhetorically constructed positions; each with their own particular ideological underpinning.

Utilising Brian Sutton-Smith's rhetorical conception Miguel Sicart (2014) proposes a 'portable theory'. For him, play is autotelic – an activity with its own

goals and purposes. It's boundaries however are not formally rigid, there is no clear differentiation between the world of the game and the world at large, it is negotiated. Rather than basing his understanding on an analysis of any particular object or activity Sicart (2014) describes the complicated interrelation with and between the things that form daily life in a relational sense. Katja Kwastek (2013) steers a similar course to that of Sutton-Smith and Sicart. She points towards plays value in interdisciplinary approaches, and uses the term as a 'boundary concept' one that is "useful for defining research questions that pertain to a variety of disciplines – and for identifying the characteristics that unite and differentiate their individual perspectives" (Kwastek 2013: 71).

Kwastek (2013) makes productive use of Susan Leigh Stars (1989) term 'boundary concept'. For her it is a highly flexible concept; plastic and existing on a spectrum that ranges from the abstract to the concrete. Weakly structured in common use, and strongly structured in individual-site use, as such it can adapt to both local needs and to different individual usage. While Sutton-Smith argues variability is the key to play: being structurally quirky, redundant and flexible; for Kwastek, processes which cannot be controlled by rational means make play impossible to define clearly.

Kwastek, (2013) posits Saleen and Zimmerman (2004) as identify three different categories of rules: operational, constitutive, and implicit. She argues that while Huizinga only considered operational rules (instructions, agreements) constitutive rules concern the underlying logic of a system, and implicit rules implicate the domain of broad social norms. For Kwastek (2013) under such conditions it is almost impossible to deny the importance of rule systems in any form

of play. Rule systems constitute plays characteristics of freedom, self-containedness, and artificiality.

For Helen Schwartzman (1978: 222) on the other hand “play is a mode not a distinctive behavioural category … an attitude or frame that can be adapted towards anything”. Gregory Bateson (2000) in his *A Theory of Play and Fantasy* points out the paradoxical nature of play, arguing it is both what it appears to be and what it does not appear to be. In invoking set theory and other framing devices, Bateson proposes his philosophy be taken up in psychopathology and techniques of psychotherapy, to be used to effectuate changes in what he calls patients 'metacommunicative habits'.

For Bateson (2000) the message this is play precipitates a paradox by attempting to discriminate between categories of different logical types. This has important implications for therapy, which he points out is a framed interaction between two people. For Bateson (2000:192) any experimental action, in which a proposal to change the rules is implicit, “is itself a part of the ongoing game … an evolving system of interaction”. Bateson (2000) concludes that these paradoxes of abstraction are a necessity, and they must be a part of communication in order for it to be able to evolve.  Without them “life would be merely an endless interchange of stylized messages, a game with rigid rules, unrelieved by change or humor” (Bateson 2000:193).

If the abstract is a necessary part of communication that allows it to be able to evolve, then the paradoxical nature of play phenomena points towards the potential usefulness of a speculative approach in their analysis. The fort-da game as played by Sigmund Freud’s grandson is a classic example of a case that has been analysed and re-analysed over time. Such analyses, by subsequent generations of

writers, points towards ground-breaking work in the fields of psychology and philosophy and have greatly advanced our understanding of human drives.

In his 1920 essay *Beyond the Pleasure Principle* Sigmund Freud (2001) moved beyond the analysis of sexual pleasure and began to formulate his theory of drives: Thanatos, the death drive, added to Eros, the sexual and creative drive. In the essay he provides his much remarked upon description of his grandsons 'fort-da' game (the throwing away and retrieval of a cotton real by an infant in his cot) as an example of what he called elsewhere a “repetition compulsion based upon instinctual activity” (Freud 2003). In his analysis of this game Freud described the disappearance and reappearance of objects within the child's reach as symbolising their psychic disconnection from their mother. For Jacque Lacan (1977: 62) this moment marks nothing less than the birth of the subject “It is with his object that the child leaps the frontiers of his domain … In the object to which the opposition is applied in act, the reel, we must designate the subject”. D. W. Winnicott (1991) mapped this transition from infant to subject, and on to fully-fledged member of society; “There is a direct development from transitional phenomena to playing, and from playing to shared playing and from this to cultural experiences” (Winnicott 1991:51). For Winnicott transitional phenomena are objects outside the child’s subjective self that it uses to help detach itself psychologically from the mother/infant pair. It is through playing with these objects that the young child forms social bonds with others and eventually is able to experience a cultural life. Felix Guattari (1992) develops his schizoanalysis in contradistinction to both Freud and Lacan's analysis of the game. Guattari's (1992) schizoanalysis is posited as the continuous creation of the self, a process of permanent autopoetic renewal. In describing Freud's Fort Da game as an example of a refrain, (an aesthetic

enunciation, through which fragments detach from and move content around, catalysing and bifurcating) he differentiates schizoanalysis from Freudian and Lacanian psychoanalysis. Guattari describes the game as neither a feeling of frustration at the loss of the mother and the universal principles of life and death, nor as a transcendent signifying order. Rather it is a desiring machine, "working toward the assemblage of the verbal self – in symbiosis with the other assemblages of the emergent self, the nuclear self and the subjective self – and thereby inaugurating a new mastery of the object, of touch, of a spatiality dissociated from Winnicott's transitional space" (Guattari 1992: 74-75). For O'Sullivan (2010) Guattari's schizoanalysis examines the asignifying semiotics of the game, the fact that through the game the child encounters unforeseen universes of the possible. He argues that Guattari's ontology is post-human, a reciprocal relation, "always in process, fragile and dynamic – between the infinite and the finite." (2010: 275).

> "There is no encounter or relation of intimate intrication between two distinct drives, Eros and Thanatos, but a coming and a going at infinite speed between chaos and complexity. Fort is chaosmic submersion; Da the mastery of a differentiated complexion" (O'Sullivan 1992:75).

If the playing of a game can be described as an example of a refrain: an aesthetic expression, an engagement with the infinite though which different domains are deterritorialised and deterritorialised, H.G. Gadamer (1985) in *Truth and Method* describes the true being of art as existing in the fact that "it becomes an experience changing the person experiencing it" (1985:92). Such a phenomenological approach enables him, when enquiring into the mode of being of

play, to make connections between art and play. He argues that while the subject of the experience of art (the work itself) endures, the subjectivity of the one experiencing it changes. And his significant insight is that similarly, the essence of play is independent from the consciousness of those who play. “The players are not the subjects of play; instead play merely reaches presentation through the players” (Gadamer 1985:92).

To support this argument Gadamer (1985) examines the metaphorical use of the term play, arguing that when a term is applied in such a way to a realm it is not originally intended for, its original meaning emerges. Gadamer (1985) discusses phrases such as; the play of light, of waves, of forces, of limbs, of bearings in a component case, of words, arguing that what is actually meant in each of these cases “is the to-and-fro movement which is not tied to any goal, that would bring it to an end” (Gadamer 1985:93). It is this back-and-forth movement he argues, requiring no effort, yet so central to the definition of play, that who or what performs it is immaterial. “The movement of play as such has, as it were, no substrate. It is the game that is played – it is irrelevant whether or not there is a subject who plays.” (Gadamer 1985:93).

Gadamer's (1985) definition of play it might be argued is a medial one; something is playing, play is spontaneous and the fact that no conscious effort is required enables any given subjectivity to relax when performing it's refrain. Rather than arguing that animals also play, Gadamer reverses this previous insight by stating that “man too plays” (1985:94), just as we might describe the play of light, or of play fighting between young mammals, what is being described is a natural process. For Gadamer's (1985), because play is a part of nature, it's final meaning for him is pure self-presentation.

Alan, D. Schrift (1990) in his *Nietzsche and the Question of Interpretation: Between Hermeneutics and Deconstruction,* argues that Gadamer (1985) locates within language a universal ontological structure. Language as the universal medium in which understanding is realised, insomuch as language is the central point where "I" and the world manifest their original unity, the mode of language then is interpretation.

Schrifts (1990) analysis of Heidegger's reading of Nietzsche questions Heidegger's proposition that Nietzsche's philosophy announces the completion of the task of the forgetting of Being, and in so doing signalling the end of Metaphysics. Instead Schrift (1990) proffers a reading of Nietzsche's work as a speculative Philosophy, and one that emphasises play, becoming, and process.

Schrift (1990:54) argues that only a decentred, non-totalising reading can hope to follow the path of Nietzsche's thought "as the Dionysian play of world-construction and world-destruction". Schrift (1990) reads the genealogical character of Nietzsche's project as the attempt to discern the origins of the contemporary anthropological, psychological, and ethical manifestations of the will to power; these, he argues are axiological issues that address notions of value.

In a discussion of Heraclitus' 52nd fragment (Eternity is a child playing draughts, the kingly power is a child's) in his *Philosophy in the Tragic Age of the Greeks*, Nietzsche (1962:52) sees play as cosmic, beyond all rationality and ethics, a situation in which chance is dominant over necessity, and unruliness and the arbitrary supersede self-imposed codes. Eugene Fink in *The Ontology of Play* (1974) argues that Heraclitus remains the originary root of Nietzsche's philosophy, and in his conception of play Nietzsche finds his deepest intuition of the reality of the world as grandiose cosmic metaphor. For Fink (1974) when Nietzsche grasps being and

becoming as spiel, he no longer stands in the confinement of metaphysics. For Fink (1974), in Heraclitus, Nietzsche finds a kindred spirit, whose tragic wisdom affirms passing away and annihilating, and a repudiation of Being. For Nietzsche, (1962:64) in watching the games of noisy children, Heraclitus "pondered the play of the great world-child Zeus, and the eternal game of world destruction and origination".

Fink (1974) argues that the fundamental phenomena of human existence are all intertwined; they interpenetrate and influence one another reciprocally. For him the task is not limited to the description of biological, physical and intellectual facts. Instead, what is required is an analysis of the moments of existence, an intuition of the harmonies and tensions that produce "the paradoxes of lived experience" (Fink 1974:150).

Fink (1974:150) sums up existence thus; "in his essence man is mortal; by nature he works, he struggles, and by the same count he plays" For him these then are the interwoven fundamental particulars of human existence, this mingling of self-expression and repression, an existence of continual tension with the self, in which we live. Play for Fink (1974), does not fall under the same final ends of these other human activities. In its spontaneity play is the living impulse. "If we compare play to the rest of life with its impetuous dynamism, its provoking orientation towards the future, play appears as a serene presence with a meaning sufficient to itself … a respite with a spark of eternity in it" (Fink 1974:150).

Fink (1974), seems to imbue play with a vital spark, while real things are involved in the world of play, they take on the character of a real "appearing-to-be". In doll play for instance, the young child imbues the material body of the doll with a promethean live force, and positions themselves in the nurturing role of

'motherhood'. For Fink (1974:157) “Play is a symbolic act of representation in which human life interprets itself”.

Fink (1974:160) describes his philosophy as a “speculative concept of play”, in which the meaning of being springs from play, where our symbolic action puts us in the presence of the meaning of life. He is well aware that this is a powerful and seductive concept, and that it opens up an aesthetic interpretation. “we mortals are oriented to play in a mysteriously fundamental sense, precisely because we can produce magically things that testify to our creative power and our glory … opening up [...] human existence to the abyss of being by means of play” (Fink 1974:161).

Lawrence M. Hinman (1974) in *Nietzsche's Philosophy of Play* posits play as a concern that runs throughout the philosophers thought. Hinman uses Nietzsche's recurrent theme as a means to seek to overcome what has been characterised as a fundamental contradiction in his work. Hinman (1974) argues that Nietzsche's work rests on a view of human activity and the world as play, and that by taking such a position his project can be interpreted as possessing some unity.

Nietzsche, in confronting nihilism, ranks human activity. Hinman (1974) argues that for Nietzsche the overman, and the free-spirited child are examples of the player par excellence, free and in control, while lower ranked players are dominated by the game. Hinman (1974) describes Nietzsche's will to power as a term that most fully describes creative play as the creation of a world, and through it “the world is transformed by the overman's will to power from a chaotic interplay of forces into a structured play which eternally repeats itself as the creative play to the will to power (Hinman 1974: 107).

Hinman (1974) reads five distinct ways that Nietzsche uses the term play in his early text *The Birth of Tragedy*. For Hinman (1974) in this work Nietzsche

asserts that art makes life possible by seducing us to live through an illusion, and that art is therefore a form of a game. Nietzsche describes two different types of artistic activity as characterised by the Greeks, and named after two of their gods, the Dionysian and the Apollonian. He understands Dionysian art as coming about through a playing with intoxication. Such an altered state leads to the dissolution of subjective identity, the demolition of individuation, and the annihilation of principles of sufficient reason. For Hinman (1974) these are unstable and destructive forces and it is important that the artist plays with doses of such Bacchic excess, and self-oblivion.

As a counterpoint to this savagery, the Apollonian artist is aware of the need for illusion, and the dream provides the clearest manifestation of this drive. Hinman (1974) argues that for Nietzsche primordial reality is the need for transformation. It is through the creation of illusion, typified in dreams, that existence redeems itself. “Apollonian art is playing with these dreams: the creating of illusion becoming consciousness of itself.” (Hinman 1974:110). We always awake from dreams, any art form that bases itself upon them is unstable, but the Apollonian artist is fully aware of this playing with instability.

For Hinman (1974) The Dionysian lurks behind The Apollonian, the two forces are locked in an endless struggle, and he reads the tragic in Nietzsche's analysis of the Greeks as the “unending interplay of these two different types of games which existence plays with itself.” (Hinman 1974:110). In his reading of another of Nietzsche's texts, *Thus Spoke Zaruthustra*, Hinman (1974) argues that for Nietzsche, play is the highest form of human activity and furthermore it is the only type that allows one to go beyond nihilism. Hinman (1974) explains that in order to overcome nihilism it is not sufficient to find new goals: instead they need to be

created. The precondition for this is necessary strength, i.e., Nietzsche's will to power. Hinman (1974) argues that Nietzsche accepts the critique of existence that arises out of nihilism, but his is no passive consenting, instead what is required from us is a strengthening of the spirit to create, “nihilism is overcome by recognising and affirming the play-character of existence and by creating our own play. If one accepts the critique of existence contained in the experience of nihilism, creative play is the only alternative to despair” (Hinman 1974:114).

Play for Hinman (1974) is then the only way to overcome nihilism, it is in fact the highest form of activity of the spirit. The essential structure of the will to power, he argues, is the play of forces set against the backdrop of nothingness, any power seeking to increase itself, does so against what Nietzsche describes in Will to Power as the larger worlds repetitive dice-playing existence. Nietzsche categorises us as the will to power and nothing more, and Hinman (1974) argues that this implies we are part of this play of forces and that our activity is play.

Hinman (1974) goes on to qualify Nietzsche's will to power in terms of his critique of the self. He argues that Nietzsche's dynamic quanta – forces that are beyond quantising, number, cause and effect, subjectivity – would most properly be called players, in the game of existence. Such a definition Hinman (1974) adds does not imply any subject. Quanta of power can be used to distinguish between that which plays and that which is played with, and Hinman (1974) contends that Nietzsche's overman represents that towards which every quanta of force strives, the highest concentration of power. For Hinman (1974:118) the overman “represents the highest, most powerful, most creative form of human play”. The more powerful the less of a plaything, and the will to power, as creative play, is the creation of a world the organising of dynamic quanta of force, and the control of their interplay.

Hinman (1974) contends (as have many others) that temporality is of our own making, and play is an activity that exists uniquely in the moment. Play, for Hinman (1974) is an activity for its own sake, it is not carried out to achieve some goal that exists outside of it, hence, this "existing in the moment which is characteristic of play is the condition of the possibility of the complete affirmation of existence" (Hinman 1974:120) and this he argues is central to Nietzsche's thought. The notion that the world could be radically other than its current configuration is implicit in the idea of the world as a play of forces, and the eternal recurrence is in one respect our imposition of order upon those blind forces. This Hinman (1974) argues is a truism in the Nietzschean sense. In the sense that truth is a production, an active determination, a will to power, no less.

For Gilles Deleuze (1983) reading Nietzsche: "Return is the being of that which becomes. Return is the being of becoming itself, the being which is affirmed in becoming" (Deleuze 1983: 24). Mihai Spariosu (1989), argues that Nietzsche reverses the Platonic-Kantian hierarchy of metaphysical values and "the play of the senses and imagination gains priority over the play of understanding and reason" (Spariosu 1989: 75). Spariosu goes on to assert that as with Nietzsche and what he calls 'other artist-metaphysicians': "Deleuze repeatedly claims that his writings are best understood as aesthetic play" (Spariosu 1989: 153). For Spariosu (1989:153) "Deleuze rediscovers and reaffirms the prerational beginnings of metaphysics in poetic thought as a playful manifestation of unmediated power".

Meditations on aesthetic play or an aesthetic of play links the two domains of play and art for Gilles Deleuze in a disruption of certainty: "This play, which takes place only in thought and results only in a work of art, is also what makes thought and art real, disturbing the reality, the morality and the economy of the world"

(Deleuze 1990: 76). The next chapter in this thesis, is on art. It develops aesthetic notions and explores projects that seek to disturb reality. Art that engages with audiences – or what will be termed after Kwastek (2013) ‘recipients’ – that enables the production of refrains, in playful, non-determining relations.

## Chapter Three – Art

Simon Penny (1999) calls for a critical technical practice in art, one that is aware of the difficult encounter when abstract numerical machines are interfaced with cultural practices interested in perceptions and affects. The articulation of this problematic can be traced back to The Enlightenment, an event described as creating a schism between art and science, a process whereby "science parted company with art and hooked up with industry, creating Industrial Capitalism on the one hand and Romanticism on the other" (Penny 1999). It has been categorised as the period that saw the emergence of the subject of modernity (Foucault 1984), and this appearance of the modern individual has also been seen as "contemporaneous with the emergence of mechanistic paradigms: nowhere [ ] more apparent than in modernist art" (McMahon 2002:5). It would seem then that contemporary arts practice, particularly the type which seeks an engagement with or through digital technology, has much conceptual work to critically engage in.

Many writers have returned to the philosophy of that time and Immanuel Kant's work on: aesthetics, the sublime, and the beautiful continues to resonate too this day. Philosophers such as: Gilles Deleuze, Michel Foucault, and Martin Heidegger have used his work as a touchstone and it still provides a foundation for contemporary writing on art including in the work of: Brian Massumi, Melissa McMahon, Anna Munster, Steven Shaviro, Isabelle Stengers and many others.

Michel Foucault (1984) in examining Kant's minor text *Was ist Aufklärung* (What is Enlightenment) argues that The Enlightenment can be defined as a modification of the relation that links will, authority and the use of reason. The obligation that Kant presents to us in his letter to the Berlinische Monatschrift

newspaper is: to use reason, and at its outset logical thought is tied to individual subjectivity. For Foucault this is *the* condition of modernity. For him who we are is to an extent historically determined by the Enlightenment. In Foucauldian terms the Enlightenment is constituted as a complex set of historical processes and power relations that are conveyed through various technologies. Foucault's broader body of work could more generally be described as examining these relations, as seeking to disconnect the possibilities of growth from the intensification of power, in order to conduct an experimental analysis of our condition (Foucault, 1984). He sees Kant as a fellow traveller in this task, as someone who critically interrogated his own historical milieu and who pointed the way to conceiving "as an attitude, an ethos, a philosophical life in which critique of what we are is at one and the same time the historical analysis of the limits that are imposed on us and an experiment with the possibility of going beyond them" (Foucault 1984:50).

One of Kant's major achievements was to help conceptualise a modern notion of aesthetics. The use of the word aesthetic as a descriptive term for the concept of beauty did not come about until the Enlightenment. The history of the term reveals an interesting genealogy. Stemming from the Greek word *aisthētikos* for perceptible things and *aisthesthai* to perceive. It referred to an ability to receive stimulation from the bodily senses. In his *Metaphysica* Baumgarten (1739) re-applied the word aesthetics, to mean the "sensing" of beauty and thereby invented its modern usage. Taste, for him was the ability to judge according to the senses using feelings rather than the intellect. Kant initially sought to reserve the term for the scientific definition of sensibility. In his *Critique of Pure Reason* (1781), he attempted to reorient understanding to the etymologically correct sense of the science of the conditions of sensuous perception. By the time he was writing his *Critique of Judgment* Kant's

(1790) definition conformed to Baumgarten's usage, and thereafter he employed the word aesthetic to mean the judgment of taste or the estimation of the beautiful. Both Baumgarten and Kant were seeking to position art autonomously and were for the first time formulating a truly modern conception of it. As such art is disentangled from the tradition of premodern societies, and as Stephen Zagala argues becomes "divorced from a direct embeddedment in definite social functions and contextualised as valuable cultural commodities worthy of accumulation in themselves" (Zagala 2002:22).

A new social role is ascribed to art as its connections with religion are severed. Christopher Kul-Want (2010) argues that Kant's idea that art is not an object of knowledge has entailed a change of orientation towards the nature of the aesthetic experience, critical approaches to art and the conception of subjectivity. Kant's work brings the problem of the unrepresentable to the fore, his *Critique of Pure Reason* declared that philosophy had no business dealing with the existence of God, which is the subject of faith and therefore not knowledge. In the *Critique of Pure Reason* Kant (1781) attempts to define a philosophy of knowledge, and discusses the effect that the synthetic and a priori have upon it. For Kant (1781) the synthetic is a synthesis with what is unknown, and therefore unrepresentable, while the a priori in contrast comes before transcendent principles. For Kant then, an aesthetic judgment is subjective, relating to the internal feeling of the subject and not to any qualities in the external object. Art is now no longer an object of knowledge: it is a site of experience.

Much of the writing of Martin Heidegger is constructed as a dialogue with Kant. In *Being and Time* (1988), in arguing that Dasein is the historically determining characteristic of Being, he posits Kant as the only previous philosopher

to consider the problematic of temporality. In *Kant and the problem of Metaphysics* (1997) Heidegger redefines metaphysics in terms of scientific knowledge. He brings Kant's *Critique of Pure Reason*, his 'copernican revolution' into dialogue with Aristotle and Plato in order to reveal the inner possibility of ontology, in his notion of Dasein.

For Heidegger (1988:47) Kant's thought ultimately works within and does not go beyond structures laid down by Aristotle. In much of his own writing Heidegger looks back to the Ancient Greeks in order to establish first principles. He has shown for instance how art and technology are two terms that share the same etymological root in the Greek word *technē*. While they may share the same beginnings, for Heidegger (1997), the ways in which they come to be articulated within modernity are very different. In *The Question Concerning Technology* (1977) he argues that philosophy ends in technology which is the inevitable culmination of metaphysics, while art's purpose is to “reveal”. In *The Origin of the Work of Art* (2002) Heidegger articulates for art two functions: disclosure and representation. Technē brings forth what is normally unacknowledged, and this is the truth of the essence of tools and products, but the role of representation falls to the work of art as a “happening of truth” and as such the work of art determines the truth. Dasein for Heidegger is both the state of being, and a process of becoming (although this is circumscribed by any given epochs limited possibilities). The work of art then serves as a reminder to the community to affect change by drawing to a close the historical epoch of which it is a part.

For Heidegger art and technology, while sharing an etymological root seem to be very different phenomena. Modern technology is invented by humans, and therefore the anthropological conception of it quite correctly makes it instrumental, a

tool. In *Traditional Language and Technological Language* Heidegger (1998) argues that it is only with modernity and through the application of science that the knowledge that technology truly is becomes expressly developed. Technology unlocks the energy of nature. It transforms, stores and distributes it: and in so doing controls it. Modern sciences transformation of nature into a calculable objectivity, argues Heidegger, is a variety of modern technology that has become "inexorable in its limitless reign" (Heidegger 1998:137). He goes on to discuss the transformation of language into information that modern technology effects. The use of abstract information, the simplicity of its signs and formulae, ensure the possibility of rapid communication. For him, "it is from the technological possibilities of the machine that the instruction is set out as to how language can still be language. The kind and character of language are determined according to the technological possibilities of the formal transmissions which execute a sequence of continual yes-no decisions with the highest possible speed" (Heidegger 1998:140). Hubert Dreyfus (1967) reminds us of one of Heidegger's central themes, that philosophy has come to an end in the present epoch. "For Heidegger technology with its insistent on the 'thorough-going calculability of objects', is the inevitable culmination of metaphysics, the concern with beings to the exclusion of Being … It has found its place in the scientific view … the fundamental characteristic of this scientific determination is that it is cybernetic, i.e., technological" (Dreyfus 1967:41).

Seen in relation to Heidegger's writing on art and technology any critical technical practice is left to draw certain conclusions, either we need, in some sense or other, to move beyond metaphysics, or to grapple with the issues of its scientific, instrumental nature. Bernard Stiegler (1998) criticises Heidegger for the very instrumental thinking that he himself distinguishes, citing the possibility of an

artistic instrument. “Not only does Heidegger think the instrument; he thinks on the basis of it. Yet he does not think it fully through: he fails to see in the instrument the originary and originarily deficient horizon of any discovery, including the unforeseen; he fails to see in the instrument what truly sets in play the temporality of being, what regarding access to the past and, therefore to the future, is constituted through the instrument techno-logically, what through it constitutes the historial as such.” (Stiegler 1998:245).

While it is a simple task to read in Heidegger's writing some discomfort with the modern, instrumental conception of technology, he does present the possibility that it might begin to undermine itself, for instance; “the frenziedness of technology may entrench itself everywhere to such an extent that someday, throughout everything technological, the essence of technology may come to presence in the coming to pass of truth” (Heidegger 1949:35). Rutsky (1999) argues that the extension of Heidegger's notion of enframing may lead to the emergence of a conception of technology from out of the modern notion, more in keeping with the unsettling artistic essence, that remains ongoing within it. Rather than a break with tradition he argues that this should be considered as a Heideggerian turning. “For Heidegger, the history of modernity can be read as an ever-increasing technological effort to regulate and secure the unsettling, 'artistic' aspects inherent in technē. Through this enframing, the unsecuring tendency of technology is given a set destination, directed towards instrumental ends” (Rutsky 1999:7).

If the purpose of Heidegger's art is to reveal, then it could be argued that ultimately, he is concerned with its effect, its reception, Art as representation. Gilles Deleuze on the other hand studies arts affect, it's expressive and productive capacities. Deleuze rejects Heidegger's notion of the end of metaphysics, and in fact

categorises his own work as a continuation of the task of metaphysics declaring in interview; “I feel myself to be a pure metaphysician.... Bergson says that modern science hasn't found its metaphysics, the metaphysics it would need. It is this metaphysics that interests me” (Villani 1999:130). Deleuze read and was influenced by many figures from the history of Philosophy including; Hume, Bergson, Nietzsche, Spinoza, and also Kant.

In *Kant's Critical Philosophy* Deleuze (1963) radicalised Kant's writing. Smith and Protevi contend that for Deleuze, Kant's genius was “to have conceived of a purely immanent critique of reason—a critique that did not seek 'errors' of reason produced by external causes, but rather 'illusions' that arise from within reason itself by the illegitimate (transcendent) uses of the syntheses of consciousness”, (Smith and Protevi 2013). Deleuze describes his own work as a philosophy of immanence, and criticises Kant for not fully pursuing the same approach. For Deleuze then, Kant does not go far enough and in making consciousness immanent to a transcendental subject reintroduces an element of identity. Smith and Protevi (2013) argue that for Deleuze, Kant assigns the power of synthesis (identity-formation) in the field to the activity of the always already unified and transcendent subject.

Steven Shaviro (2009) claims that certain crucial aspects of Kant's thought pave the way for Deleuzes' philosophy, particularly his aesthetics, as in his *Analytic of the Beautiful* in the *Third Critique*. Shaviro (2009) posits a critical aestheticism that he positions at the conjunction of the work of Kant, Deleuze and Alfred North Whitehead which he considers as helping to illuminate contemporary art and media practices. For Shaviro (2009), Kant's theory of the beautiful is one of affect and singularity, and implies an entirely new form of judgement. “For Kant, aesthetics has no foundation, and it offers us no guarantees. Rather it throws all norms and values

into question, or into crisis" (Shaviro 2009:1). Beauty is not objectively there in the world, nor in nature, but is something that we attribute to it, aesthetic judgements are therefore subjective. A judgement of taste involves an un-coerced response on the part of the subject, to the object that is being judged as beautiful. Shaviro (2009) sees a type of recognition of the way that the object adapts itself to the way we apprehend it, while remaining indifferent to us. For him this is an adaption in the Darwinian sense, one which he uses Deuleuze and Guattari's (2010:10) famous example of the wasp/orchid diad of apparallel evolution to illustrate. Beauty is an event, and it does not exist in the object: it occurs upon a subjects encounter with it. What is important for Shaviro (2009) is its effect, (although perhaps we would do well to describe this in the Deleuzian sense as its *affect*). "As pure contentless communicability, beauty is also a pure effect, divorced from its rational and material causes." (Shaviro 2009:6).

While for Kant the world emerges from the subject, in *Difference and Repetition,* in seeking the conditions for possible experience and through his reading of Spinoza, Deleuze (1994) insists upon the univocity of being. There are then, no essential differences between mind and matter, subject and object, human and non-human. Any actual differences can be described as situational, they are merely differences of degree. Empiricism then can be regarded as ultimately correct, all of our knowledge comes from experience, and there is nothing outside of experience. For Shaviro "There can be no formal, permanent distinction between the observing self (the self as transcendental subject, or subject of enunciation) and the self being observed (the self as object in the world, or subject of the statement). There can therefore be neither phenomenology nor positivism, and neither cognitivism nor behaviorism" (Shaviro 2009:27).

The separation of the how and why no longer make sense. Deleuze (1994)

describes the virtual as a transcendental field or a structure that conditions and generates the actual, the virtual is then a principle of emergence and creation. For Shaviro "if Being is univocal and everything is an event, and the human and the rational hold no special privileges, then epistemology must be demoted from the central role that it generally holds in post-Cartesian (and especially post-Kantian) thought" (Shaviro 2009:30).

For Deleuze (1994) works of art are able to reveal the conditions of sensibility and the aim of art is to produce a sensation. Zagala (2002) argues that Deleuze's reunification enables a "science of the sensible [that] can account for the conditions of real experience. It is the real that must be accounted for by metaphysics. This involves reconfiguring Kant's philosophical project so that the transcendental conditions become immanent to the real" (Zagala 2002: 24). Art works for Zagala then, become an experimental exploration of the transcendental realm, and they provide the possibility of a disjunctive use of the faculties that Deleuze extends; they bring to the critical project of metaphysics a process of negotiation.

While Heidegger writes about Greek temples and non-specified paintings by Van Gogh, much of Deleuze's writing is taken up with a discussion of art. He writes about the art of the cinema (in his books *Cinema I,* and *Cinema II*), of painting (Klee, Kandinsky, and Pollock are all discussed in *A Thousand Plateaus*), and an entire book on Francis Bacon. Smith and Protevi (2013) argue that Deleuze's *Francis Bacon: The Logic of Sensation* (2003) should be read as a philosophical exploration of the "transcendental domain of sensibility". In looking at different aspects of Bacons painterly technique and its affects, Deleuze constructs a series of philosophical concepts and develops for his philosophy both an intensive conception

of space and a virtual conception of time.

For Deleuze (2003) there are not sensations of different orders, but different orders of one and the same sensation; for sensations to exist, force must be exerted on a body. He sees sensation as the master of deformations, the agent of bodily deformations. The body then, in receipt of the force does not sense the force itself, it receives something quite different. "I become in the sensation and something happens through the sensation, one through the other, one in the other. And at the limit, it is the same body which, being both subject and object, gives and receives the sensation. As a spectator, I experience the sensation only by entering the painting." (2003:34-35). Art cannot be cognised, only sensed, it divides perceptual processing and disavows conceptual ordering: for Smith and Protevi "This is exactly what Kant in the Third Critique called reflective judgment: when the concept is not immediately given in the presentation of art. With art we reach 'sensation,' or the 'being of the sensible'" (Smith and Protevi 2013)

In *What is Philosophy* Deleuze and Guattari (1994) ascribe to Art, Science and Philosophy very different roles. The exercise of philosophy is "the art of forming, inventing and fabricating concepts" (Deleuze and Guattari 1994:2) while science is prescribed the role of creating functions, and art that of affects. As Steven Zagala points out "thought is not co-extensive with knowledge: philosophy thinks with concepts, science thinks with functions and art thinks with sensations" (Zagala 2002:21). Art does not need concepts to think, an artist may take a concept from philosophy but only if it is created as a sensation.

Isobelle Stengers, (2008) contends that these definitions of philosophy science and art appear at first to be very classical in their constitution. Science, the role of which is the creation of functions, sounds to her very much like the Royal, or

Major science of *A Thousand Plateaus*. (Deleuze and Guattari 2004:387-467). While with art, the language is very conventional "composition is the sole definition of art. Composition is aesthetic, and what is not composed is not a work of art" (Deleuze and Guattari 1994:191).

Stengers (2008) initially takes issue with *What is Philosophy,* why she asks did Deleuze and Guattari chose art and science to produce a contrast with philosophy? Why partition these three divergent fields, and if so, why only these? She goes on to argue that in emphasizing composition *What is Philosophy* resists forming any link between art and the revelatory or transcendental. Art is the creation of blocs of sensation, the compound of percepts and affects. "Even if the material lasts for only a few seconds it will give sensation the power to exist and be preserved in itself in the eternity that coexists with this small duration. So long as the material lasts, the sensation enjoys an eternity in those very moments" (Deleuze and Guattari 1994:166). There is a disavowal of any differentiation between a rationality, that rules the realm of experience and matter of facts, and, anything transcendent, situated beyond words, where "men face ultimate questions and follow meditative paths that lead nowhere" (Stengers, 2008). Stengers goes on to argue that there also seems to be a forgetting of the nomadic, itinerant sciences, that follow the singularity of their terrains (Deleuze and Guattari 2004:387-467). Scientific function however is described in *What is Philosophy* as a creative act, an event in the history of science. What unites philosophy, art and science in *What is Philosophy* is that they can each, in their own particular ways, be described as types of creative process.

In *A Shock to thought: expression after Deleuze and Guattari* Brian Massumi (2002) argues that Deleuze and Guattari's entire ontology revolves around expression, contra communication. Their expression is no mere non-critical

subjectivism, as with an expressionism that relates to the self-governing reflective individual. For Massumi (2002) perception in the form of shocks, transforms the individual into some sort of “receptive machine”, positing Baudelaire's “kaleidoscope equipped with a consciousness”, as its ideal description.

The force of expression strikes the body, it is direct and it is not mediated, but as it passes through the body a transductive transformation takes place of the body, there is a cascading affect. The body, in the process of being affected by expression changes along a series of physical, biological, physiological, and eventually on occasion, psychological processes. Massumi (2002) uses the example of a ray of light, in passing into the human eye it strikes on the level of physics, it's impulses then pass through many different interlocking levels – physical – chemical – biological, at each of these levels it produces a dedicated effect that is captured as content. For Massumi then, expression is an event and the task for a theory of expression becomes “how to account for stability of form, given an event” (Massumi 2002: xvii). This question thus transforms the hylomorphic model, these processes of formation cannot be accounted for if a common form is assumed between content and expression, or subject and system, Massumi cites Deleuze (1988:87) who argues that emergence, mutation, change and affect are all composing forces, rather than composed forms. There is then no form of forms to connect the two sides, only the process of their passing into each other, and this is an immanence – “in the gap between content and expression is the immanence of their mutual deterritorialization” (Massumi 2002: xviii). For Massumi the performative is a direct avenue for the passage of expression into content and that content is actively modified by expression.

Technologically enabled art works and their participants are engaged in novel

transductive relays, productive of affect. Roy Ascott (2003) argues in *Is There Love in the Telematic Embrace?* that networked technology makes explicit what is implicit in all aesthetic experience, it is as much creative in the act of the viewer's perception as it is in the artists production. The artwork in the technological era is no longer a window onto some sort of ordered reality, rather "we have at the interface a doorway to undecidability, a data space of semantic and material potentiality. The focus shifts from the observed object to participating subject" (Ascott 2003:237). Melissa McMahon (2002) argues that in his *Critique of Judgement* Kant was dealing with tensions between the dominant mechanical paradigm of his day and an organic model of cohesion and it is through seeking to resolve this tension that he "creates a third term between the organic and the mechanical which is precisely the aesthetic … Or indeed the 'machinic'" (McMahon 2002:4). The next section of this chapter will look at artistic practice that through its use of technology seeks to creatively engage with its audience, to create an encounter with them through the composing forces of affect.

In describing Interactive Art projects Katja Kwastek (2013) argues that ambivalences in perception are characteristic of aesthetic experience. "Knowledge doesn't arise through successful comprehension of sign systems designed to be interpreted in a specific way, but through the interplay between transformative experience and its reflection. In interactive art, too, the recipient's activities oscillate between physical experience and cognitive interpretation" (Kwastek 2013: 88).

Andrew Pickering (2002) contends that the discipline of Cybernetics presents a shift in scientific endeavour from epistemology to ontology. For Pickering (2002:430) "cybernetics directly thematizes the unpredictable liveliness of the world, and processes of open-ended becoming.

Etan, J. Ifeld, (2012) examines the historical interplay between technology and cybernetics within contemporary art. He argues that the conceptualization and practice of emergence, a notion shared by cybernetics and art practice opens up new possibilities and modes of production. For him, such processes provide the potential of "an indeterminate and noninstrumentally playful evolution, allowing for a creative freedom" (Ifeld 2012:62).

Influential branches of art redefined their purposes and their objects in the later part of the Twentieth Century. Jack Burnham (1968) first articulated and championed 'Systems Art' and proposed that the ideas and processes involved in creating a work were now taking precedence over the aesthetic object that was being produced. Art now existed in a new mode, one in which it recursively critiqued its own objects. The art object 'dematerialised', as the focus shifted away from end products: art moved away from objects and towards systems.

Burnham was the curator of the seminal *Software, Information Technology: Its New Meaning for Art*, exhibition in 1970 and advanced an early example of a cybernetic definition of art. The exhibition sought an exchange between its' exhibited projects and its' audience. Burnham was witnessing a changing world and predicted a seismic paradigmatic shift: "We are now in transition from an object-oriented to a systems-oriented culture. Here change emanates, not from things, but from the way things are done" (Burnham 1968). Burnham witnessed how during that period we were entering 'the second age of machines', an age of information processing systems. For him, the function of this new technology was no longer the production of materials, but the analysis and generation of information. Influenced by Cybernetics and the philosophy of Ludwig von Bertalanffy, Burnham described the term 'Intelligent Systems' as referring to both humans, and computer

environments. He argued that the continued evolution of communication and control technology would enable a new type of aesthetic relationship: “the 'aesthetics of intelligent systems' could be considered a dialogue where two systems gather and exchange information so as to change constantly the states of each other” (Burnham 1971:96).

Edward Shanken (2002:434) points out that many of the art-and-technology projects exhibited in Software reveal a meta-critical process, and that they challenge “the systems of knowledge (and the technologically mediated modes of knowing) that structure scientific methods and conventional aesthetic values.” Hans Haacke’s Visitor’s Profile was displayed as part of the Real Time Systems series in the exhibition. It used a DEC PDP 8 computer to collect and tabulate data gathered from visitor’s questionnaires in real time. The project developed out of an earlier work that presented the incendiary results of a manual poll conducted with visitors to the Information exhibition staged earlier that year. This time visitors were asked for demographic information (age, gender, education, etc.) as well as their opinions on a variety of provocative subjects. These ranged from: “Should the use of marijuana be legalized, lightly or severely punished?”; to, “Assuming you were Indochinese, would you sympathize with the present Saigon regime?” (Burhnam 1968). Technology was used to enable art to become a responsive, real-time system that “merges with the environment in a relationship that is better understood as a ‘system’ of interdependent processes” (Burhnam 1968). The work presents the concept of an audience taking an active role in their information environment and also being involved in the creation of the work of art. It was also a piece of institutional critique that revealed information about this art’s particular audience. As Charlie Gere (2006: 138) argues: “by interrupting the smooth transmission of information it was

possible to interrogate the structures and systems of power by which it was enabled". For Shanken (1999) this demographic research as art: "opened up a critical discourse, following Foucault and others, on the exclusivity of cultural institutions and their patrons, revealing the myth of public service as a thin veneer justifying the hierarchical values that reify extant social relations."

For Krzysztof Ziarek (2004) while contemporary forms of power are increasingly 'infotechnical' in their modes of operation, what he describes as 'Arts Forcework' comes from its interrogation of powers forms and flows, it's questioning of powers increasing flexibility and reach. Arts Forcework lies in its ability to revise, and re-channel the momentum of technopower: "irreducible to negation or absence of power, [it] is a transformation in the mode of relations determinative of modernity: from relations of power, production, and machination towards a power-free form of relating." (Ziarek 2004:54). In so doing, for Ziarek, such art does not contribute to the metaphysical and 'productionist' logic of being; a logic of making, manipulation, and power that he argues determines art as commodifiable.

There are many examples of art works that open up critical discourses by revealing existing power relations whilst also seeking to forestall or interrupt their own commodification. The rise and proliferation of the Internet that began during the last decades of the Twentieth Century has led many artists and writers to explore and seek to understand the collective phenomena that is the network; an enormous part of the milieu in which we live, that conditions and affects our lives in these relational and transactional terms.

Anna Munster (2013) is one such author who explores the diagrammatic tendencies of this phenomenon in order to emphasize the relational dimensions of these computer networks that she argues are immanent in their infrastructure. She

seeks to understand the collective processes at play in what she terms ‘networked aesthesia’. These are processes that conjoin the nonhuman and human through the dynamics of recursion. Our relationships with one another, through and with digital technologies, are enmeshed in an architecture that depends on crisscrossing routes and pathways, “networking-processes, proto-formations and imperceptible human/machine currents that conjoin social, info-technical, and aesthetic elements in novel ways” (Munster 2013:9).

Munster (2013) uses the term ‘data-undermining’ to describe techniques utilised by a range of experimental art projects that consider how data comes to be aggregated and managed in contemporary networked cultures. Ubermorgen's *Google Will Eat Itself* (GWEI) is posited as an example of a project that exploits the inventiveness of the algorithm operating at the generative basis of Google’s search-oriented world, to invent an imperceptible realm where the encounter changes from one Munster describes as ‘Google-us’ to ‘Us-Google’. GWEI's ‘autocannibalistic’ approach is to set in place a process that deconstructs online advertising mechanisms by subverting Googles economic model. “We generate money by serving Google text advertisments (sic) on a network of hidden Websites. With this money we automatically buy Google shares. We buy Google via their own advertisment (sic)! Google eats itself - but in the end ‘we’ own it!” (Ubermorgen n.d.).

Munster (2013) maintains that GWEI produces an aesthesia of the algorithm, drawing on its relational variability, where click-through value is generated by the artistic and cultural networks of people who connect to the project. The point now is not to try and escape from Google's world but to explore its deformations, to stretch and tear. “A cartographic mosaic emerges alongside or extends energetically and intensively out from the Google-us coupling: a transversal, autopoietic

transformation is in the process of being enacted … an autoproduction, in which new territories, alongside the recursive map-world/Google-us coupling are being created" (Munster 2013:69).

Munster argues astutely for the use of the diagram as a technique to spatialise and temporalize the nature of contemporary computer networks. Such processes she argues should remain aware of the textures of transitions within these systems; of the variations in their speeds and affects. Diagramming for Munster is a relational technique that can feed back into the community. Munster is interested in 'contraptionist' devices, that are able to foreground incorporeal processes. She argues that the material diagram combines both technique and process to provide a new kind of technics, one that "concatenates the instrumental and the catalytic" (2013:194). GWEI provides an interesting example of a contraptionist conjunction of the instrumental and the catalytic. GWEI makes use of, in Munster's terms, data undermining techniques, activating the utility of search to create an aesthesia of the algorithm. In so doing GWEI helps us develop new understandings of the systems that have become our milieu, and at the same time creates novel social formations around, through and with them.

The ubiquity of the network has meant that systems flourish. For Matthew Fuller (2008) "Art methodologies are a range of ways of sensing, doing and knowing generated in art", and Art systems proliferate as they conjoin with other entities, to produce new affiliations. These relations can be described as being, among other things: mutational, transductive, transversal, and existing at different scales. These Art methodologies, articulated as systems, for Fuller (2008) emerge out of 'sensations doubling'. As art seeks constant redefinition and creates new ecologies in conjoining with other realms, resonances between and across these conjugated

domains are produced.

Olga Goriunova (2010:1) describes Art platforms as bringing together human-technical creativity in just such ways, and in order to "generate a cultural organisational mechanism powerful enough to disrupt some of the domineering and stratifying tendencies of digital media, culture, and society" (Goriunova 2010:1). Informed and co-developed by its users an Art platforms aesthetic force is amplified by what Goriunova describes as 'Autocreative processes'. Autocreativity is autopoietic, and distributed across domains. For Goriunova: "Autocreativity allows us to think creative processes as a becoming that lies between the human, the technical, and the social, and to investigate the parts performed with creativity by the assemblages of these things" (Goriunova 2010:43). As such these platforms disturb existing media ecologies.

I posit my own project *Cubed* as adhering to these notions of: system, network, and platform aesthetics described in this chapter. For Ifeld (2012) Krzysztof Ziarek describes how technology can be operated in a non-instrumental mode of play, how its digitization can be creative – and generate new spaces for art: this is precisely what *Cubed* seeks to achieve. It develops Burnham's (1971) 'aesthetics of intelligent systems', setting up dialogues across domains. It is also after Munster (2013) a contraptionist device, that conjoins the instrumental and the catalytic.

*Cubed* is also a Simondonian (1958) 'open object'. It's openness to the futurity of the network it articulates, and the platform that it helps produce makes it, in the classical Cybernetic sense, an object to think with. *Cubed* can help to diagram a transindividual and transductive relation between the human and the technical that is enacted through the relation of play. This open relation, is a connection that creates its own aesthetic. For Fuller (2008) Art methodologies do not only endure as blocks

of sensation, they also “emerge out of sensations doubling” and this for him is an apprehension of melody. Deleuze and Guattari’s (1998) notion of the refrain would seem highly akin to Fullers’ characterisation of melody. The project in its articulation enacts a refrain of playful processes, deterritorialisation’s and reterritorialisation’s across diverse domains, and in so doing establishes its own particular aesthetic. Cubed enables a reflective approach to be taken to my research and this reflexive methodology, this praxis, opens up new insights into notions of play, art and technic.

## Chapter Four – Methodology

David Gauntlett (2022) looked at the UK's Higher Education research assessment exercise, the Research Excellence Framework (REF) to determine what it's fundamental definition of research was. He found that it was very simply stated as: 'a process of investigation, leading to new insights, that are effectively shared.' For him this straightforward definition clearly includes practice-based research. I would argue, that this is also the case for the approach I take to my research, a practice-led one.

The Cubed project is a creative technology development and prototyping undertaking, and the basis of my practice-led research. I am a researcher who is its creator. I am engaged in an exploratory creative process that enables me to investigate my research questions. My research method is an auto-ethnographic one, with myself as the researcher being involved in a reflexive enquiry. This approach, a praxis, combines its theory building within its practice. Knowledge and techniques from different academic and art disciplines are interwoven and this inter-disciplinary approach develops a synergistically constructed knowledge. My objective is to search for new understanding and develop new concepts, and this is achieved through the development and testing of new technology, and reflecting in and on those processes and developments.

For Schön (1991) reflection in action brings about a tacit understanding. For him thinking and acting form a dialogue, implementation is built into the enquiry and is not bound by technical rationality - it is reflexive. For Schön (1991) the processes of reflection in action turns the practitioner into a researcher, and in so doing constructs new and novel theory. Reflection on action for Schön (1991) is how a practice may change, and it is through these processes that I am able to develop

new knowledge. The act of reflecting through research is a process of investigating and probing ones own practice and in so doing generating new knowledge of a speculative nature. New forms of technologically enabled artworks use novel devices and create new contexts for audience (recipient) engagements on which the practitioner can reflect.

For Linda Candy (2020) The situation of practice - its context - is all important. Art requires a process that explores and creates creative acts and experiences. "Creative practice requires a continuous exploration of ideas, materials and tools" Candy (2021:51). These explorations constitute the design and making of artefacts and installations. This combination - the consideration of both the artefact and its use - I would describe as a curation of relations. The organisation of relations of Human Computer interactions and territorial arrangements are the mode of existence of Cubed. Candy (2021) argues that emerging forms of digitally amplified practice are breaking new ground and "Inevitably this practice becomes a research process when innovation in the art and the technology are closely intertwined … Together, practice led research drives innovation in technology and technology facilitates the making of novel art forms" Candy (2020:179-180)

The digital artefact that is Cubed plays an 'amplifying role' Candy L. (2020:186-192) that of mediator and partner. It is a project that can be described as “Art as Experience Design”, Edmonds (2010) and as such is designed for pleasure, play, and engagement. It enables mediations between its recipients and the environments in which it is played with. These mediations are facilitated by haptic interactions with the human sensorium that engage affectively. Foregrounding through use notions of embodied cognition. Amplifying an awareness of the living

body through 'somatic practice' Shusterman (2012). Making the aesthetic experience integral to living, and the body a means to enhancing and experiencing creativity.

Hui (2016) argues that while digital objects do not annihilate experience, they do modify meanings. For him knowledge systems become more and more rule based over time and certain systems tend towards superficial interactions that diminish engagements. We might consider the repetitive gestures we make with mouse and keyboard when entering data into a system. For Hui then "to restore the foundation of knowledge, knowledge cannot be conceived in purely abstract forms, such as represented by detached symbols but must be founded in human 'kinesthesis', that is, the movements of the living body." (2016: 205)

The knowledge I develop as a practitioner is embedded in my understanding of the processes of making, use and installation, which is then given context through my writing, processes of reflecting for, during, and at a distance when describing the project - all techniques described by Brigid Costello (2018) an artist who is also interested in creating participative interactive engagements. Candy (2020) argues that research artefacts should point towards new artistic forms and this claim to novelty needs to be developed and explicated textually. I claim Cubed to be just such a novel artistic form and the task of this thesis is the elucidation of that claim. Design methodologies adapted from creative arts research that after Barrett and Bolt (2007) situate the emergent work as a form of enquiry, were utilised to drive the material development of this practice led project. The *Cubed* (www.cubed-3.org) art & digital technology project provides the practical aspect of this work. *Cubed* is designed for experience following Costello and Edmonds' (2009) formulation, and as such provides a method for experimenting with open-ended interaction strategies. In so doing *Cubed* creates a balance between directing the play experience of its

participants and providing opportunities for play to emerge through these participants own creative activities.

Barrett and Bolt (2007) propose that artistic practice be viewed as the production of knowledge as philosophy in action. This practice-led research project, is a generative enquiry that takes an interdisciplinary approach and develops Simondon's (1958, 1964) analogical method in the production of its knowledge. This further applies Kolb's (1984) experiential approach, and as such assumes that learning takes place through action and intentional reflection on that action. The knowledge developed here and the situation in which it occurs cannot therefore be separated. As such the knowledge this research project generates is in Haseman's (2007) sense performative and it is in this thesis that the complexity of its emergence is fully cognised. Haseman (2007) argues that the performative paradigm opens up a rich field of possibilities for practice-led research to complete its contribution to knowledge. The performative knowledge described in this thesis is, in Gilbert Simondon's (1964) conception, an operation that brings being and thought into a co-determinate relationship, one that comes about through their mutual co-individuation.

Describing Simondon's work, Muriel Combes (2013:78), notes that when the Technical Object is put into action "it becomes the site for a new relationship to nature, no longer a utilitarian relationship mediated by the organism of human individual, but a relationship of immediate coupling of human thought to nature." Combes (2013) makes a strong argument that Simondon claims technical activity as the model for collective relation. This relation of reciprocal causality and conditioning is further developed in the Cubed project and cognised in this thesis.

Massumi (2009) contends that Simondon's technical mentality is very contemporary in the way that it links the question of the nature of technical objects to the evolution of the network. For Massumi, Simondon's exploration of the Technical Object evolving through the network into a post-industrial 'open object' frames the discussion that is comprehensively relevant today. Massumi (2009) points out that, in Simondon the figure of the network – infused with potential energy, resonating in metastable relation – affords a possibility for escaping the hylomorphic mode of thought and action. It is my contention that the *Cubed* project considered at the current state of its development is such an object, ripe with potential and – to use another of Simondons terms – not yet concretised. For Simondon then, "In order to think individuation, being must be considered neither as a substance, nor matter, nor form, but as a system that is charged and supersaturated, above the level of unity, not consisting only of itself" (Simondon 2009:6). Cubed is just such a system that enables the cognition of particular individuating processes.

In Simondon's (1964) philosophy of individuation, relation is ontologically key. Individuals contain potential and this capacity becomes actualised in, whilst simultaneously consisting of these very relations. Individuals, be they either: physical, vital/psychic, or psycho/social, have the ground of their being in transduction; an operative process which is also the ground of thought. For Combes (2013:21) in Simondon's philosophy it is relation that "has the status of being and constitutes being". The difference between physical and living domains are not one of substance (in either their form or content), but rather of kind; their type and speed of individuation. Simondon (1964) asks how can we understand processes such as becoming and individuation without freezing them within predetermined concepts? For him knowledge is an operation that brings being and thought into a co-

determinate relationship and this occurs via individuation. The making of *Cubed*, the playing with *Cubed*, and the reflection upon these reciprocal individuating processes of transduction provide the ontogenetic potential of this project to create knowledge. Being has no unity of identity, for Simondon this would describe a stable state, unable to transform. Instead "being possesses transductive unity" (Simondon 1964:31). Being a metastable entity, organised in a particular configuration of heterogenous elements, it is important that we do not hypostatise the discreet individual. An individual is an example of an aspect of being, and as such is: a field of resonance, a reticulation, a mode; and in its individuation and becoming, a capacity to dephase. An individual in all it's becoming possesses a transductive force that can overflow out of itself. In order to grow, to change and crucially, in so doing: to innovate. Transduction for Simondon also describes a "procedure of the mind as it discovers. This procedure consists in following being in its genesis, in carrying out the genesis of thought at the same time as the genesis of the object is carried out" (Simondon 1964:32). For Muriel Combes (2013:8) "In transduction metaphysics and logic merge; it expresses individuation and allows it to be thought".

For Simondon (1964) there is no constitutive knowing subject, observing the world beyond (as for Kant), and information is not the technology of transmission (as with Cybernetics). The operation of individuation does not permit an already constituted observer, and in Simondon's writing information is the operation of taking on form. Transduction describes a "procedure of the mind as it discovers. This procedure consists in following being in its genesis, in carrying out the genesis of thought at the same time as the genesis of the object is carried out" (Simondon 1964:34).

Combes (2012) argues that for Simondon beings are considered as partial solutions to problems of incompatibility between separate levels of being. Only an analogical method is adequate to the understanding of ontogenesis, and the founding act of this method is the putting into relation of operations. Such an approach provides knowledge of structures from the perspective of the operations that animate them, and not the reverse, and this is an ethical methodology.

> To act ethically is to "construct a field of resonance for other acts or to prolong one's acts in a field of resonance constructed by others; it is to proceed on an enterprise of collective transformation, on the production of novelty in common, where each is transformed by carrying potential for transformation for others. This, then, is the definition of collective individuation, opening into the dimension of transindividual."
> (Combes 2013:65)

Combes sees in Simondon's affirmation of the immanence of an ethics of becoming a counterpoint to the teleology of technical culture that arise when 'sense of becoming' is hypostatized. For her in Simondon's work, "At stake is nothing less than the relationship between thinking technics and thinking the collective" (Combes 2013:67). She argues that what technicity can do as an amplifying network is yet to be invented, and we need to create a technics that is faithful to the transductive nature of beings:

> ".. it is Simondon's virtue to have seen that technics as network now constitutes a milieu that conditions human action. Out of that milieu, we

> need simply to invent new forms of fidelity to the transductive nature of beings, both living and nonliving, with new transindividual modalities for amplifying action. For, in our relation to preindividual nature, multiple strands of relation – to others, to machines, to ourselves – entwine in a loose knot or node, and that is where thought and life come once again into play" (Combes 2013:78).

This research project creates such an amplifying network, it enables the relation of humans to technology and to one another to be reinvented through the nondialectical nonalienating disparate relation of play. The analogical method it develops aids our understanding of the ontogenesis of *Cubed*, in the putting into relation of technical and social/ psychic operations. This ethical methodology provides knowledge of structures from the perspective of the operations and practices that animate them.

In his *The Practice of Everyday Life* Michel De Certeau (1984) considers the countless practices by which we re-appropriate place organised by the techniques of sociocultural production; techniques that he calls, after Michel Foucault (1977) 'dispositifs'. He analyses the mechanisms of the microphysics of power that have redistributed discursive space in order to make it the means of what he calls a generalized, discipline of surveillance. If this grid of discipline is becoming ever more extensive, how he asks: can we resist being reduced to it? De Certeau (1984) argues that while statistical investigation might grasp the material of these practices, their form is more elusive. "Statistics can tell us virtually nothing about the currents in this sea … it is less a matter of a liquid circulating in the interstices of a solid than of different movements making use of the elements of the terrain." (De Certeau

1984:34). For him each individual is a locus in which a plurality of socially determined relations occur. He describes a 'phrasing', a Brownian motion that is produced by the artisan-like inventiveness of bricolage and the discursiveness that combine these elements in everyday practice. Upon the terrain, on which can be located specific modalities of what he terms enunciative practice the possibility is opened up of analysing the immense field of an “art of practice” (De Certeau 1984:24).

Many of these everyday practices (e.g., talking, reading, moving about), are tactical in character, and they are continually performed. Unlike strategies that are imposed from above, tactics postulate the constitution of a space of their own, that is independent of speakers and circumstances, or models that construct systems based upon rules that ensure the systems production, repetition and verification. De Certeau's (1984) 'futurology' seeks to explore the difference between tactics and the strategic representations offered to the public by the mechanisms of the microphysics of power as the product of these operations. He considers the status of the individual within technical systems, arguing that the involvement of the subject diminishes in proportion to the technocratic expansion of the system. When tactical actions enter into De Certeau's (1984:32) 'primarily regulatory field' of technocratic rationality, however they can turn this to their advantage and constitute a 'second level'. This is De Certeau's art of being 'in between', while strategies produce and tabulate space the tactics used by individuals bend and manipulate it. De Certeau (1984) sees his task as following the trajectories of the tactics pursued which “select fragments taken from the vast ensembles of production in order to compose new stories with them” (De Certeau 1984:35). For him every society manifests formally somewhere the rules that its practices obey. The games a society plays, being detached from

everyday competition, carry out disjunctive operations. Games formulate rules, they organise moves and constitute a memory (defined as storage and classification) of 'schemas of actions'. If, De Certeau (1984) argues, we can see a formalization of tactics in these games, we might gain a preliminary understanding concerning the practices of spaces. An object to think with like *Cubed* can therefore be used to discern such practices.

There is in the playing of games, something of a dérive over a terrain, that consist of circulations, and drifts over space. De Certeau (1984) differentiates space and place. For him a place is “an instantaneous configuration of positions” (De Certeau 1984: 117) and he argues, this implies an indication of stability. Space on the other hand exists when vectors of direction, velocities, and time variables are also taken into account. It is composed of the intersections of mobile elements, and is the effect of the operations that orient, situate, and temporalize it, that make it function. Space is then, “actuated by the ensemble of movements deployed within it” (De Certeau 1984: 117), and furthermore it acquires the quality of performance. Interactive art projects such as *Cubed*, performed by an engaged audience, through the act of playing with them, create just such spaces.

De Certeau (1984) was interested in these perceptible performances and the construction of relationships between places and spaces through one’s movement through them. For him these process function enunciatively, three times over. They are an appropriation of the topographical system, a spatial acting out of the place and this in turn implies relations among differentiated positions. For Katja Kwastek (2013), after De Certeau, Interactive Art (IA) often assigns the recipient (a relational term she uses to describe the IA's engaged audience) an active role, even the main one, “in the material realisation and manifestation of spatiality” (Kwastek 2013:104),

this active relationship between recipient and IA constructs a territory. These relations of space can be described in Deleuze and Guattari's (2004) terms as 'deterritorializations' and 'reterritorializations' and are processes that the *Cubed* project both enables and maps.

De Certeau (1984) uses the term tactics to describe a temporal movement through space, against the ordering effect of spatial coordinates. “The space of a tactic is the space of the other … a manoeuvre within enemy territory.” (De Certeau 1984:37). Strategies are planned having oversight over a general field they privilege spatial relationships. The tactic's mobility on the other hand means it can take advantage of chance opportunities; for De Certeau (1984) it poaches, it is guileful, and it is the art of the weak, a minor practice we might argue in the sense that Deleuze and Guattari (2004:83-122) define it. For De Certeau (1984) tactics lend persistence to time, they are rapid movements, they change the organisation of a space to the relation of successive moments on an action. Deleuze and Guattari (2004:123-165) took a keen interest in the fluxes and flows that constantly define and redefine territories, in the molar and molecular processes that cause them to change over time, processes they describe as territorializations: deterritorializations and reterritorializations.

Play can also be cognised after Simondon (1958) and Mackenzie (2002) as a transduction: the modulation of a disparity across or within domains, that expresses a processual sense of individuation. Such an approach has profound methodological consequences and seen this way play is a range of pre-personal and non-subjective behaviours, which in Felix Guattari's (2009:206) terms aid the formation of productive 'assemblages of enunciation'. For Guattari these are process of self-organisation and singularization, with such assemblages providing a context for

pragmatic 'referent generation' in any particular social, material, or institutional field. Guattari (2009:209) calls these processes the 'micropolitics of meaning', whose assemblages can provide both the site of investigation and a means of access to them. I would further claim that, through pre-personal play behaviours, such assemblages adopt a minor mode – a 'becoming child' **(**Deleuze and Guattari, 2004:272) – and are 'deterritorializing and reterritorializing' (Deleuze and Guattari, 2004) in their social, psychological and institutional affects.

In Chapter Twelve of *A Thousand Plateaus* 1227: Treatise on Nomadology – The War Machine, Deleuze and Guattari (2004) describe how a machine is always an assemblage, for them the relation of the war machine to the state apparatus is difficult to conceptualise, it exits in a 'pure form of exteriority', and comes into being only in its own metamorphosis. In so doing their conception of the machine brings together transductively notions of: nomadism, metallurgy, and new mathematical conceptions. The nomad is the "deterritorialized par excellence." (Deleuze and Guattari 2004:421).

Deleuze and Guattari (2004:60) argue that: "Deterritorialization must be thought of as a positive power that has degrees and thresholds". The simplest examples that they site are biological, for instance a fragment of embryo is deterritorialized when it changes thresholds or gradients and is assigned a new role by its new surroundings. Another well-known example that Deleuze and Guattari (2004) present is that of the relationships between the orchid and the wasp: "The orchid deterritorializes by forming an image, a tracing of a wasp; but the wasp reterritorializes on that image. The wasp is nevertheless deterritorialized, becoming a part of the orchid's reproductive apparatus. But it reterritorializes the orchid by transporting its pollen. Wasp and orchid as heterogeneous elements form a rhizome"

(Deleuze and Guattari 2004:11). For Deleuze and Guattari (2004) this is not an imitation, but rather "a capture of code, surplus value of code, an increase in valence, a veritable becoming, a becoming-wasp of the orchid and a becoming-orchid of the wasp. Each of these becomings brings about the deterritorialization of one term and the reterritorialization of the other. The two becomings interlink and form relays in a circulation of intensities pushing the deterritorialization ever further" (Deleuze and Guattari 2004:11).

In taking a playful approach; in seeking to harness the nomadic aspects of children's playground playing; in attempting to enable the deterritorialization of existing: social, psychological and institutional assemblages through these articulations, my practice has sought new forms of technologically enabled engagement with its audience. As Guattari notes "nothing prohibits machinism and humanity from starting to have fruitful symbiotic relations" (2009:297). For Anne Sauvagnargues (2016:73) "it is pointless to differentiate the fine arts from technics, because the same modulating processes operate in the two cases". Sauvagnargues (2016) argues that Deleuze and Guattari (2004) make it possible to simultaneously think technology and art.

Gary Genosko (2002) goes further still in describing Félix Guattari's transdisciplinary metamethodology as a method that he used to create experimental assemblages (for instance at the La Borde clinic). For Genosko such an approach means that; "New organisations, non-standard forms of communication and direct semiosis between machines and politics … all contribute to the creation of new forms of subjectivity" (Genosko 2002:4).

Genosko (2002) contends that there exist linguistic and machinic orders, the relations between which are constituted in machinic assemblages of enunciation. For

Genosko (2002), Guattari's transversal tools enable him to connect the relatively autonomous components of subjectivity, to establish an interiority, and to connect them with and in other assemblages. Genosko (2002) points out that transversality was Guattari's critical re-evaluation of psychoanalytic transference in the context of the treatment of groups of patients that took place in a collective hospital setting. Genosko (2002) maintains that for Guattari there is always a third mediating object in any real situation that acts as an ambiguous support or medium. In his clinical work the real situation is institutional life, and the mediating object is the group. As Genosko (2002) reminds us, Guattari is borrowing from D.W. Winnicott, (1953) his transitional object, and transitional space, that paradoxical space in which the child begins to take the place of the as yet psychologically unseparated mother and uses it to individuate and form a notion of self. Winnicott (1953) described play in just such terms, as a transitional object, a support mechanism and as a means to create subjectivity. Clearly then, transversal tools are well suited to the study of playthings and play phenomena, as well as opening up our understanding of subjectivity as a collective and auto-producing process.

For Gary Genosko (2002) Guattari's assemblage concept functions on a number of different levels; this includes the description of different sign types, while seeking to avoid binary reductions. Genosko argues that Guattari seeks to distinguish between assemblages that move towards the generative and the interpretive, i.e., those that generate effects of signification and subjectification, and those that are transformational and pragmatic, i.e., that are a-signifying, and deterritorialized, and as such release 'abstract machines' as defined by Deleuze and Guattari (2004:155). Such transformational effects are what *Cubed* sets out to achieve.

Deleuze and Guattari (2004:560) assert that the state apparatus

reterritorializes space, and in so doing sets up a regime of signs along the lines of property, work and money. Such signifying regimes stratify space and put in blocks to becoming, blocking possible 'lines of flight'. Play, as a becoming-child, the taking up of a minoritorian position, I would argue, can develop new lines of flight. The ‘ludic model’ (Deleuze and Guattari, 2004:551) enabled by *Cubed* exists in smooth space. If we describe *Cubed* in its deterritorializing aspect, it's making territorial assemblages open onto something new, its 'placing of its parameters into continuous variation', (Deleuze and Guattari, 2004:121) These movements that it expresses, point diagrammatically to the possibility of a Simondonian (1964) problematic of disparation, a modulation at the membrane, in short: a Deleuze-Guattarian, (2004) refrain.

For Deleuze and Guattari (2004: 342-386) In Chapter Eleven 1837: Of the Refrain, in *A Thousand Plateaus* “Childhood scenes, children's games: the starting point is a childlike refrain”. The refrain can be described as an aesthetic expression; one which enables the detachment and transfer of content, moving it across and through domains catalysing and bifurcating as it goes.

Deleuze and Guattari (2004: 342-386) classify refrains in terms of those that territorialize, i.e., those that mark a territory (e.g., bird song), those with some other special function (e.g., the lullaby that territorializes a child's sleep), and those that gather forces within their territory. Deleuze and Guattari (2004: 342-386) do not provide a definitive list of refrains, and in fact suggest that there may be many types, some of which remain undiscovered. Of particular interest to them is the refrain that marks new assemblages, and that passes into new assemblages. Such refrains do so by means of processes of reterritorialization and deterritorialization. Deleuze and Guattari (2004: 342-386) posit the nursery rhyme as a complex example. These are

territorial refrains sung differently from neighbourhood to neighbourhood, refrains that “distribute game roles and functions within the territorial assemblage; but also cause the territory to pass into the game assemblage” (Deleuze and Guattari 2004:360). If it can be argued that the singing of songs marks the passage of a territory into a games logic then it is no great leap to argue that this space, which a game takes over, becomes further deterritorialized and reterritorializated through the games actual playing. The act of play might be therefore also be described as a refrain. Our understanding of this refrain, it's relations and processes, would benefit from a diagrammatic mapping. *Cubed* is a means with which to carry out such a task, and as such provides a window onto the virtual and the creative processuality through which we constantly create our world.

As Janell Watson (2008) points out in her *Schizoanalysis as Metamodeling,* Felix Guattari was a pupil of Jacque Lacan's and was drawn to his early uses of modelling. She explores Guattari's development of his metamodeling ideas as a corrective to what she sees as Lacan's increasingly formalised structuralism. For Watson (2008) “By pointing out the machinic nature of the symbolic order, Lacan calls into question man's freedom to choose suggesting that humans, like machines, are caught up in an external determinism”. Watson argues that Lacan's psychoanalysis is premised upon this external determinism to which he argues we are all subject, and this points towards an involuntary return to our unconscious. For her Lacan's analysand must embrace chance, in order to make his thoughts available to the analyst. Lacan compares cybernetics to psychoanalysis, “To understand what cybernetics is about, one must look for its origin in the theme, so crucial for us, the signification of chance” (Lacan, 1988:185). This is a relationship that has led many including; Johnston (2008), Liu (2010), and Watson herself (2008), to connect

Lacan's psychoanalysis, with cybernetics, and game theory. Poe's purloined letter and Freud's Fort Da game as described by Lacan both suggest a radical symbolic activity shared by humans and calculators. If the chain of possible combinations in such encounters can be studied as an order which exists independently of all subjectivity: then this is Lacan's symbolic order itself. Games of chance connect us to the symbolic order, and connected to them are all our repressed affects and memories. Watson (2008) calls subjectivity "the very intersection of this messy meeting point of signs and signifying residue irrupting from the unconscious." She points out that for Lacan, symbolic identification (as with for instance: love, rivalry, etc.) is the introjection of only a partial signifier, his 'trait unaire'. Watson (2008) argues that Guattari is not that interested in identification, but he does seize upon the notion of the partial signifier, and builds his ontology around it. For her while Lacan seems content with modelling personal relations, Guattari "connects this semiotic problem of 'transcription' and 'codification' to the far-reaching consequences of 'machinic' processes in contemporary technological society" (Watson 2008).

Watson (2008) argues that in his early work Guattari proposed a semiotic theory of the atomic and cosmic universe, in which theoretical enunciation precedes material existence. While Lacan's interest in cybernetics and games of chance helped him construct his structuralist approach to psychoanalysis, Guattari takes apart his masters' models and builds his own, coming to the conclusion that theoretical enunciation precedes material existence. This for Watson is the basis of Guattari's theories of the machine and a-signifying semiotics, processes made accessible via diagrammatic encoding.

*Cubed* offers the opportunity to trace a mixed semiotics. An application of Guattari's 'schizoanalytic metamodellization' (1992), (2000), (2009) will help to

map, or diagram them. Guattari describes his schizoanalysis as “the analysis of the effect of assemblages of enunciation on semiotic and subjective productions, in a given problematic context.” (2009:206). Gary Genosko (2002) argues that Felix Guattari's schizoanalytic metamodellization distinguishes between symbolic semiologies and semiologies of signification. He contends that for Guattari symbolic semiologies involve semi-autonomous semiotic substances. These substances that are unrefined, primitive, non-linguistic systems, such as for instance ritual (or as I would argue play), can exist independently from the more normalizing effects of semiotic encodings. Genosko (2002) notes that while signifying semiologies are sign systems with semiotically formed substances on the planes of expression and content, A-semiotic encodings include such entities as genetic encoding, and natural encoding. These processes function outside and independently of the construction of any semiotic substance, and for Genosko these modes formalize the field of material intensities. Genosko argues that a-signifying semiotics are able to retain their independence of the signifying semiologies of language. For him they exist in a circular connection with signifying semiologies, and exist between form and matter, but without leaving the planes of content and expression, to “produce non-redundant and original conjunctions of signs and material fluxes between semiotics and real machines” Genosko (2008:168). These ideas can be difficult to grasp and are best conceptualised diagrammatically.

Guattari's schizoanalytic metamodeling is articulated through Deleuze and Guattari's (2004) concept of the diagram, defined by Watson (2008) as a way of thinking that bypasses language, for instance as with musical notation or mathematics. The purpose of such an approach is to map existential territories, and for Watson (2008) “Guatari's metamodeling promotes a radical liberatory politics ...

It allows one to construct ones own metamodels. It recognises, and even borrows from, existing models". For Guattari (1995:31) such techniques provide means by which to develop possible openings onto the virtual and onto creative processuality. Metamodeling therefor produces, creates, and finds new paths, processes of a disparation, of transductive becomings such as play can help articulate these territories, explore the techno-social coalescences – assemblages – that are formed around Art & Technology projects and their users. To work assemblages with those that use them and allow the development of philosophical notions of play and technicity that have not been previously conceptualised or understood, in order to enhance understandings of the relationships between humans and technology. Such approaches will be applied to the analysis of my own arts practice in the next chapter.

## Chapter five – My Arts Practice

My arts practice over the last decade has been concerned with the creation of projects that engage with audiences through different forms of technologically enabled play. Walter Benjamin (1990) in his unfinished opus *The Arcades Project* described play as potentially revolutionary. For him "the capacity for revolutionary transformation is present from the start" (Buck-Morss, 1989: 265). Play has the potential for transformative transgression, and claims, Tauel Harper (2009) can "lead to political emancipation". Brian Sutton-Smith (1997:233), defines play as "adaptive potentiation" arguing that it might be conceptualized as a model for emerging biological, social and psychological processes of adaptation. His conclusion, that resonates with Gilberts Simondon's (1958, 1964) concepts of individuation and transduction, is that these processes come about through the initiation of uncertainties and their resolution within the virtual domain. Phenomena described as play have been explored in many disciplines, making the term a problematic concept to articulate.

I assert that play can usefully be described after Simondon (1958) as a being of relation; a reticulation, and a field of resonance, that I posit contra the substantialist, hypostatized teleology of mainstream technical culture, as a mediation.

Two of my projects *Aquaplayne* (2006) and *Cubed* (2009) offered non-traditional physical and haptic interfaces, created with the express intention of engaging with their "recipients" (Kwastek 2013) through playful behaviour. These projects provided spaces for novel interactions, previously unimagined engagements between recipients and technologies, as well as between individual recipients and

other more passive audience positions. As such these works present an opportunity to study the particularity of these engagements, their deterritorializing and reterritorializing play phenomena: in short, their assemblages of enunciation.

While these pieces explore and develop play forms, other projects such as *An Englishman's Home Is His Castle* (2011) use play as a conceptual articulation for a more traditional aesthetic object and positions it in a more established arts context. This chapter is led by this practice and sets out to analyse and diagram these projects. For Felix Guattari (2009) the term 'assemblage' is a notion that problematises enunciation and how a subject is constructed. My aim here is to investigate how these projects form singular 'assemblages of enunciation' when entering into relations with their recipients and audiences. Having done this it will then explore what common themes unite these works, teasing out any connections that exist between them, and reflecting upon how they vary: in short to diagram (Deleuze and Guattari, 2004) them. Two of these projects *Aquaplayne* (2006) and *Cubed* (2009), have been commissioned, produced, and exhibited, Nationally and Internationally, at group shows and Festivals such as: File 2008, Sao Paulo, Brazil, and Abandon Normal Devices, (AND) Cumbria UK, 2010, while *An Englishman's Home Is His Castle* (2011) was a proposal submitted to an open call.

**Figure a: Giles Askham *Aquaplayne* (2006). Installation view, Q-Arts Gallery, Derby Image: Giles Askham**

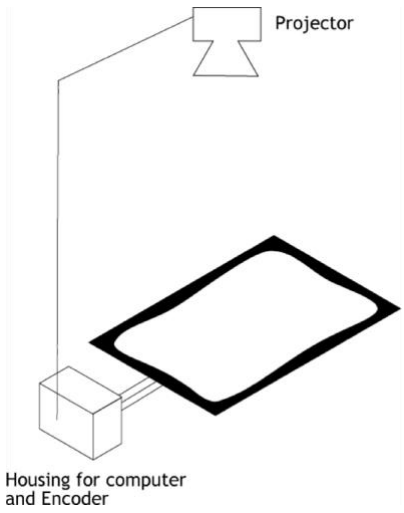


***Figure b: Aquaplayne*** **assembly blueprint.**
**Projector / computer / sensor mat system**
**Image: Giles Askham**

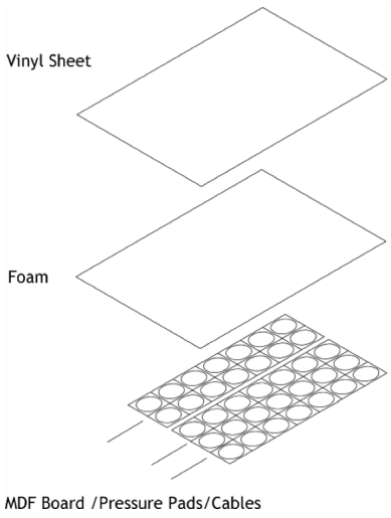


**Figure c:** ***Aquaplayne*** **sensor mat.**
**Image: Giles Askham**

The idea for *Aquaplayne* (see figures a, b, and c) came about when I was working as the curator of Peterborough Digital Arts in 2003. During an exhibition set up in the galley a blank blue screen was being projected onto a wall. A group of five or six school-children approached the screen and began using it to cast their shadows and create shadow puppets in the space. They were completely and unselfconsciously immersed in their experiences, and were clearly gaining a lot of enjoyment out of them. I would describe their encounter as blissful, unmediated, unstructured, and consisting of only those rules that were developed through their particular playing. I immediately realised the potential that this kind of technology offered in eliciting these types of behaviour, and began to consider how they might be framed and presented more formally in a gallery setting. *Aquaplayne* was the eventual result of this process, providing as it does a space for play in the context of an art gallery setting.

*Aquaplayne* is installed in a dark space and positioned upon the floor of a gallery large enough to enable audience members plenty of room to freely walk around it. Audience engagement can take on either an active or a passive form. An active role requires audience members to step into the installations' space, to cross its threshold and to become its “recipients” (Kwastek 2013). Taking on a passive role an audience member would position themselves at its periphery, and observe activity taking place within its frame.

*Aquaplayne* consists of a vinyl mat, (figures a, b, and c) approximately 3 by 2.5 metres in area, fitted over a grid-patterned array of 35 pressure pads topped with foam for padding. The pads respond to pressure created by recipients standing, walking, running, or rolling over the mat’s surface. These events trigger the projection of ripples back onto the mat via a projector attached to the ceiling directly above it (figures, a, b, and c). *Aquaplayne* is an interactive projection that presents a visual metaphor of a pond and allows many recipients to play with it simultaneously. The recipients’ relationship to the work is that of significant, active participant, and the works interface is physical and haptic. Recipients are invited to engage playfully with the work. Such engagements can be described as becomings in the Deleuze and Guattarian (2004) sense, as being produced in and through a minor mode of being – a becoming child (Deleuze and Guattari, 2004:310) as it were. The visual phenomenon of projected ripples is accompanied by associated audio clips of the sound of splashing in water. Intersecting ripples provide further sounds, thus the recipients movements create an ever-changing animation and soundtrack of their engagements.

In order to engage with the work recipients must occupy a space that is mapped-out on the gallery floor. *Aquaplayne* creates a field of expression and

provides a space for action. A surface as an interface: *Aquaplayne* is afforded by the surface tension of the meniscus of a disparity. “The horizontal plane bypasses recognition and ‘sets up’ an interactive surface, making a play of art by providing the viewer with instant access to the creative flow. In the movement from observation to participation we interface with an intelligent canvas through the automatic rendering of action into effect” (Willett, 2006). By playing with one another via the installation, splashing over the surface of a pond, *Aquaplayne's* recipients create abstracted visual imagery and complex soundscapes. These phenomena provide traces, which quickly appear and then fade, of their movements and interactions. These vestiges of the socio-dramatic play phenomena are simultaneously presented back to other more passive audience members.

The concept of the project was to bring socio-dramatic play into the gallery setting, to provide, after Winnicott (1953), a “transitional space” of open-ended social interaction and to make it the subject of an artwork. The piece offers opportunities for engagement and active participation as well as allowing non-participating audience members the opportunity to observe the types of play facilitated by the work, positioning themselves in a more passive and reflective relation to the installation.

The notions of play that *Aquaplayne* explored were further developed in my next major project. *Cubed* (for documentation see: www.cubed-3.org) was a piece created in collaboration with Luke Hastilow. Whist *Aquaplayne* designated a space in a controlled environment and sought particular responses, *Cubed* was portable. As a container of different game rules, it offered the potential for more variation in play behaviour, and sought to take over diverse spaces, to carry out in Deleuze and Guattari's (2004) sense 'deterritorializations' of existing spaces. In taking over sites

outside of the gallery setting (that would already be clearly demarcated for particular practices), *Cubed* sought to apprehend these already overcoded environments. Places that in De Certeau's (1984:200) terms are already "social spaces, stratified by technics" would be imbued with playfulness.

Commissioned by Folly as part of its Portable Pixel Playground (PPP) project, *Cubed* is an interactive art project as defined by Katja Kwastek (2013:262) as "a manifest entity, invitation to act, and basis for performance" which calls out to be activated by its audience. The playground project sought to encourage children to get active, think differently, collaborate and take risks through being exposed to new concepts and challenges created by artists. For Kwastek (2013) interaction is an aesthetic experience. For her digital technology alters the circumstances in which sensory perception occurs, and challenges pre-existent aesthetic theory by questioning its essential categories:

> "the work as the primary object of an aesthetics understood as a theory of art, aesthetic distance as a necessary condition of aesthetic experience, and the distinction between sensory perception, cognitive knowledge, and purposeful action that underlies most aesthetic theories" (Kwastek 2013: 43).

Kwastek (2013) argues that the "processuality" of such projects challenges us to find new ways to describe their disposition, the interplay of their formation. "The processes and translations that takes place between the definition of a works parameters by the artist and its active realisation by a recipient" (Kwastek 2013: 43). *Cubed* then makes use of recent advances in embedded technology to deliver a unique platform for proprioceptive engagement and creative play, to an audience who take on an active and relational role with it. Enabling a range of different individual and team-based

games, *Cubed* is a networked set of gaming objects, which "enables populations to work as open systems of communication" (Askham and Hastilow 2010), it is a meshed system that acts as both a container for multiple sets of formal game rules and a haptically enabled physical interface through which these games can be played. Consisting of eight programmable plastic blocks: lightweight, handheld, and fully portable; the set is wirelessly interconnected and forms a system that has no central controller. As such *Cubed* opens up diverse physical spaces to exploration, and as spaces in which to play. As a fully programmable system *Cubed* also offers, in its futurity the capacity for further game developments, utilising feedback and input from recipients to develop and implement simple and innovative rule-based games.

Adrian Mackenzie (2010) poses the perennial question asked by literary, sociological, anthropological, historical, and other critical studies concerning contemporary science and technology, specifically: how does technology change what it is to be human? *Cubed* is an object to think both with and through, it is an art project that offers up a diagrammatic window onto play, gaming, and how technicity is being co-created in the ever more intricate entanglements that are occurring between humans and technology.

The current paused state in the technical development of *Cubed* provides an opportunity to take time to give it meaningful consideration, to resist the projects potential marketisation, and its transformation into a product, that the securing of additional funding would probably demand. For Mackenzie (2010) "In many respects the transit time between technology and social impact on human life is too fast. To slow down enough to enter into the processes of change, other ways of constructing an engagement with change need to be found" (Mackenzie 2010:5). For

the benefit of this research the current iteration of the system can be used as an object to think with. To that end its marketability and technical uniqueness will be held in tension. Stephen Shaviro (2003:249-250) argues that missing from life in the networked society "is what is more than information: the qualitative dimension of experience or the continuum of analogue space in between all those ones and zeros." With *Cubed* a productive assemblage has been created in order to ask: what kinds of relationships are formed between the system and its users? It enables the examination of singular creations of space and place, and to explore what new machinic and subjective formations such activity might produce. Existing notions of play have previously been critically analysed and problematized in this research and *Cubed* can aid an investigation into the immanent nature of the relation between humans and technologies, helping to develop through play an understanding of the repercussions of such human-technical developments, the assemblages that create our technicity. This practice-led approach develops new knowledge in the disciplines of: Critical Theory and the Digital Humanities by utilizing tangible and embedded technical systems.

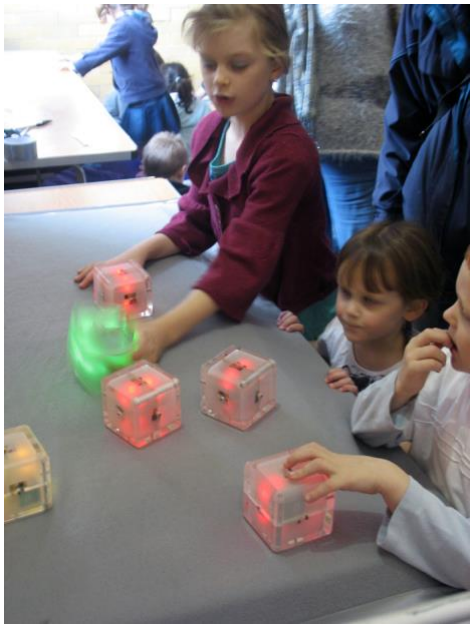

**figure d) Exhibited artwork – Cubed in Colour Cube mode. Abandon Normal Devices (AND) Festival, Grizedale Forest Park, Hawkshead, Ambleside, Cumbria. April 2010**
**Image: Giles Askham**

**Figure e) Exhibited artwork – Cubed in Treasure Hunt mode. Abandon Normal Devices (AND) Festival, Grizedale Forest Park, Hawkshead, Ambleside, Cumbria. April 2010**
**Image: Giles Askham**

Technically each cube consists of a hard-wearing translucent plastic housing, containing a Printed Circuit Board (PCB), that hosts a Microcontroller (µC), battery, interface electronics, and transducers. On each face an infrared LED and photodiode form a short-range transceiver, these are used to detect the surface proximity of other cubes and facilitate communication with them. The primary user feedback method is

an RGB LED array diffused to illuminate all faces of the cube. Integrated peripherals within the μC enable sensing, data storage, communication, and software control in response to hardware events. Conceived of as a system of Cellular Automata, (Von Neumann 1966), *Cubed* combines populations to work as open systems of communication. In such systems programs can exist across individual components or nodes. Rather than standing independently, each cube benefits from its changing relationship with others in this environmentally modelled system. The software running on each device is built upon the automata-based programming paradigm utilising Shalyto's (1991) approach in which distributed Finite State Machines (FSM) interact to form a complex, self-organising system. Each device communicates and senses using event-driven procedures in order to maintain an environmental model of the gaming system as a whole. It is this model that determines game state transitions and thus the state of play.

Formally the system consists of eight programmable devices, each a six-sided polyhedron, a cube. Each of the six sides of each cube has the ability to enter into a short-range (via surface-to-surface contact) connection with another object in the system. These communications are enabled via infrared sensors and handshake programming protocols. Each cube exists in a particular game state and this is communicated to adjacent cubes via these procedures. Depending on the nature of the communication that occurs during these connections each cubes' particular state can be altered. Each cubes' behaviour is determined by an algorithm it is running, a set of rules that determine how it will respond to another cube's proximity. Each cube has the ability to change the colour of its RGB LED array. Cubes can switch their programmable LED's to emit either: red, green, blue, cyan, yellow, magenta, or pure white light. Depending on its game state each cube will glow a particular

colour. When two cubes come into contact, and depending upon the algorithms they are running, these colours can be changed, giving visual feedback of the altered state that this transaction has affected. Additionally, using the same communication protocols, new sets of rules of engagement can be utilised. These different sets of protocols would be programmed externally, uploaded, populated across the system, and actuated in the individual devices. The system currently has three games installed: Colour Cube, Hide & Seek, and Treasure Hunt.

Colour Cube (fig. d) is a simple mimetic game in which participants match the colour of cubes to that of a system-allocated transformation cube. The transformation cube cycles through each of its six colour segments periodically. The colour of the remaining cubes is determined by their orientation

In Treasure Hunt, six cubes are hidden in the local environment and the two remaining cubes are given to two teams or individual players (fig. e). Each of the cubes in the local environment takes on a different colour, and the players' first objective is to find the hidden cube that matches the colour of their own. Hide and seek provides a variation on this game, a seeker capturing hiders, and changing the colour of the hiders cube to match that of their own, the hider now swapping sides to join the seeker in the hunt for the remaining hiders.

Andrew Pickering (2002) argues that Cybernetics saw a shift from epistemology to ontology. Traditionally science studies operate at the epistemological level, in what he calls the representational idiom, taking for granted that science is about representing the world. In an analysis of practice what is required is a shift towards what Pickering calls the performative idiom, a de-centred perspective concerned with doing things in the world. As a field that enabled the development of computing Cybernetics did not have access to abstract symbol

manipulation machines. Much of the Cyberneticists research work consisted of the design and development of mechanical devices. These included devices such as Shannons' mouse, Grey Walters' tortoises, and W. Ross Ashby's homeostat. Described by Norbert Wiener as "one of the great philosophical contributions of the present day" (1950:54), Ashby's homeostat defined the environment and organism as a coupled dynamical system. The homeostat took electrical inputs and turned them into outputs. A series of four such devices were set up so that the output voltage of one provided the input to the other three. The devices were designed to react to changing inputs, and to reconfigure themselves to maintain their stability. The homeostat then randomly and open-endedly reconfigures itself. Pickering goes so far as describing it this physically instantiated system as having agency.

The term Physical Computing was likely coined by Tom Igoe to describe a hands-on approach to developing computational interfaces that enable full body engagements. Igoe defines Physical Computing as "about creating a conversation between the physical world and the virtual world of the computer" O'Sulivan and Igoe (2004: xix). Physical computing describes projects that combine hardware and software solutions in order to create new products, tools and computational objects that engage innovatively with users.

Such engagements are often made using full-body interaction and in social settings, where groups of individuals are able to manipulate the same tools and devices. Physical Computing projects offer uniquely tangible techniques for manipulating computational information, the Nintendo Wii video game console, offered an early commercial example of such an approach. With its plethora of input devices based around the Wii remote, the platform offers an innovative experience of the videogame format. The Wii remote games controller makes use of

accelerometers and infrared sensors to map and communicate its position in three-dimensional space, enabling a more physical and gestural manipulation when compared to more traditional controllers. Another example of a much-lauded device with a uniquely physical interface is Reactable (http://www.reactable.com) created by Reactable Systems in 2003 Reactable is an electronic musical instrument that utilises a tangible interface and a highly visual and physical approach to music creation. It provides a tangible platform for real time musical creation and was inspired by modular analogue synthesizers such as the Moog. It is the winner of many prestigious International awards including the Prix Ars Electronica Golden Nica for Digital Music (2008).

New media Art at the time was working with expanded notions of interactivity to develop and produce new modes of life. Rafael Lozano-Hemmer Relational Architecture projects examined what regimes of power might arise from those developments. *Under Scan* (2006) was described by Lozano-Hemmer as an interactive video art installation. It presented pre-recorded video portraits in the shadow of – often unsuspecting – participants as they crossed public squares. The work which was installed in cities across the East Midlands and London at the time providing an excellent example of a work that repurposed public spaces for open-ended interactions of the performative type. Lozano-Hemmer anti-institutional approach expanding notions of interactivity to consider actual lived relations.

The very popular Decode exhibition held at the Victoria & Albert Museum between December 2008 and April 2009 (http://www.vam.ac.uk/microsites/decode/) helped introduce a wider public to interactive art works. Many of which had distinctive interfaces and possessed a particular physicality. Interesting examples on display in the show included Daniel Rozin's *Weave Mirror* (2007), which provides

an analogue representation of machine vision via a screen with a basket like structure consisting of articulated interwoven arcs of greyscale gradient. Transducing sense phenomena and providing a viscerally haptic experience of a visual phenomenon.

Brigid Costello is another artist who shares similar interests to my own. She is interested in creating participative interactive engagements, and experiments with designing unique experiences. Her research into her audiences encounters with her artworks have enabled her to develop novel classifications of play, which she calls a 'pleasure framework' Costello (2007). She has carried out observations of projects such as her 'Just A bit of Spin' (2007) and used these to inform her taxonomy. Her categories of the pleasures of: exploration, discovery, sensation, and camaraderie, in particular chime with the types of recipient engagement I seek to utilise.

Over the Easter weekend at the start of April 2010 *Cubed* was introduced to the public at the Abandon Normal Devices: Festival of New Cinema and Digital Culture (AND) held at Grizedale Forest Park, Cumbria. The system proved to be engaging and provoked positive reactions from the festival audience. The system initially enabled three programmes to run, Colour Cube, Treasure Hunt, and Hide & Seek.

The table-top set up of Colour Cube enabled a first mimetic engagement – A simple ‘Simon Says’ type approach - from which recipients were easily encouraged to engage in other more active interactions. In Colour Cube one cube in the set changes its colour automatically, cycling through to the next hue in its repertoire every twelve seconds, while the other cubes change colour depending upon which face they are resting. Recipients then are invited to seek to match the colour of all the cubes on the tabletop via direct manipulation. This is achieved by rolling them over the surface, or by picking them up and rotating them in three-dimensional space. The

clock is always ticking and it usually took a few attempts for recipients to match all the blocks before the onset of the flashing of the cycling cube signalled that a change in the system was about to occur, and another scramble of activity would be required to retain homeostasis.

In *The Thinking-Feeling of What Happens* Brian Masumi (2008) considers the aesthetics of interactive art. In his essay he asks: how can interactive art aspire to be art, if it is about action, while art is about perception? For him art provides techniques of experiencing the virtuality of life, of living it more fully and intensely. It is not enough to merely champion interactivity, Massumi argues that we need to evaluate what modes of experience Interactive art produces. What it can do however is take the situation as its "object". With such an articulation Massumi shifts the emphasis from interaction to lived relation. Thought this way, art practice is a technique of composing potentials of existence, of inventing experiences.

Just such potentials are invented with *Cubed*, which couples technical effect with lived affect in immanent and disparate relations of transduction. The experience of Colour cube relays a players' sense of vision into their sense of touch – haptics – as players seek to develop their hand eye coordination, manipulating the blocks; tilting, rotating, rolling them into the correct position. Such affect can even on occasion relay into kinesthesia – the sense of movement – as witnessed by the behaviour of one young player which can be viewed on video documentation shot at the time: https://youtu.be/XxBkBPTalic. The affect created by her dexterous manipulation of the blocks and her mastering of the system, transducers itself and – right before our eyes – transforms itself into a jig, an unconscious little dance, of full-bodied revelry and joy.

For Treasure Hunt each individual or team was given a cube to hunt with, while the rest were hidden in the local environment. With each hidden cube taking on a different colour, the object of the task was for hunters to find the cube that matched the colour of their own. Once this was found, the placement of the two cubes in proximity to one another enabled a communication between them, causing a change in the colour of the hunters' cube, to reveal the colour of the next cube to be found. Hunters are given license to roam and gleefully explored the terrain, creating mental maps, associations between a block's placement and its hue, often going back on themselves to previous, locations – as witnessed by the behaviour of two young players which can be viewed on video documentation shot at the time:

https://vimeo.com/15895953

– in the creation of their own sense of place in the galleries proscribed space.

Deterritorialising and reinscribing its space with their own movements and actions, this performative enactment enabled by *Cubed* The back and forth of their movements in the making of their space, the to-and-fro of their actions, akin to a transfiguration of Freuds Fort Da game, in this their creation of a territorial refrain – their continuous creation of their self's, linked to one another and to the system in processes of vital and energetic autopoetic renewal. This a radically ludic activity shared between humans and machines, producing new associated milleu's, in mutually encountering the symbolic order. Such processes having been made accessible via diagrammatic encoding. *Cubed* offering the opportunity to trace this mixed a-signifying semiotics. Cubed as a system transducing relations and creating novel frameworks.

A computational framework akin to that of Cellular Automata as devised by John Von Neuman (1966) is enacted in the *Cubed* system. This framework enables

populations to work as open systems of communication. In such systems programs can exist across individual components or nodes, by accessing rules that establish simple relationships between nodes. As Terranova (2004) has pointed out "The key idea of Cellular Automata is that there are formal structures that are able to perform global computation through a system of local rules that simply dictate the relationship of each cell / particle / node with its neighbors" Terranova (2004:110). In the *Cubed* system the physical positioning of these nodes in particular arrangements dictates the ways in which they interact with one another, triggering the rules of a particular game to be invoked. Rather than standing independently each cube benefits from its changing relationship with others in a system. Such organising principles can be extended further, by taking into account each player and their relationships with other players. Taken as a whole these interactions form a complex web of reflexive relationships, heterogeneous assemblages of playful engagement. In examining Machine Intelligence John Johnston (2008) argues that Cellular Automata (CA) can be described as parallel computational systems. For Johnston CA are very special, a type of programmable matter. *Cubed* when cognised in conjunction with its recipients is a living system whose performance provides insights into information processing and the dynamics of energy.

*Cubed* embeds computational devices into physical environments and social contexts, and feeds back into discourses of play. Part of a Computational Assemblage, involving both the technology and the different sets of players who engage with it, the locations in which the games are played and the possibility of players inscribing their own game ideas into the system, by augmenting traditional children's games *Cubed* provides a set of physical tools that enables a conceptualisation of play as the mediated flow of information between players. The

system consists of physical objects that provide both the means of playing and a tool for transfer and communication, and as such positions players as productive creators within its network.

Considering this configuration from a cybernetic or systems perspective, *Cubed* works an assemblage of ludically engaged human players, and technologically enabled gaming devices and these interactions can occur in a wide range of different environments. Its organising principles are further extended, if we take into account each player and their relationships with other players, as well as the associations between players and cubes. Taken as a whole these interactions form an ecology, a complex web of reflexive relationships, that can be described as 'heterogeneous assemblages of enunciation', (Deleuze and Guattari 2004). The heterogeneous assemblages of enunciation of the *Cubed* ecology being activated by playful engagement. Describing *Cubed* as an assemblage provides this research with the opportunity to tease apart the complex ecology that constitutes these: players, games, system, and places and spaces (be they: psychological, social, geographical, or technological) of engagement.

For Manuel De Landa (2006) Deleuze and Guattari's concept of the assemblage enables research to challenge entrenched ontological notions of interiority, and it does so by distinguishing the properties of a given entity from its capacities to interact with other entities. Such an approach therefor is characterised by notions of exteriority, the implication being that component parts may be detached and plugged into new assemblages, changing their interactions. These relations of exteriority also imply for De Landa (2006) that the properties of the component parts can never explain the relations that constitute a whole, (relations not having as their causes the properties of the component parts). Properties then are

an exercise of capabilities, and while capacities depend on a component's properties, they cannot be reduced to them since they involve reference to the properties of other interacting entities. For De Landa "A seamless whole is inconceivable except as a synthesis of these very parts, that is, the linkages between its components form logically necessary relations which make the whole what it is" (De Landa 2006:11).

The ecology that the *Cubed* assemblage helps constitute, that consists of relations between players, games, system, places and spaces, needs to be cognised in terms of its properties and capabilities, it's capacities to interact. Having done this it is then possible to map its processes and configurations, conceive of the territorial assemblage of its' refrain (Deleuze and Guattari 2004: 342-386) and diagram such relations in the mutuality of their expression and content, a technique that enables the description of both material and semiotic features of these interactions. *Cubed* as an art project can be described as providing an ethico-political articulation – in Guattari's (2000) sense – an "ecosophy" – existing between and within the three ecological registers (the environment, social relations, and human subjectivity). *Cubed* creates new assemblages of enunciation within this ecosophy, and in so doing offers the opportunity to explore the processes of its "event-centred singularity", (Guattari 1992:7), in order to activate "existential refrains" (Guattari 2000:30) that open up new fields of virtuality. Guattari (2012:27), describes his concept of metamodeling as an instrument for deciphering other modelling systems, and this is articulated via his concept of the diagram. Guattari's (2012) diagram defines a way of thinking that bypasses language, in order to develop a mixed semiotic, one that also includes what he calls a-semiotic encodings and a-signifying semiotics. For Genosko, Guattari's mixed semiotics enables "an ecologized conception of subjectivity [that] is throughly interrelational and ecological problematics may install

themselves in or attach themselves to almost any component." (Genosko 2002:109).

Making use of uncomplicated protocols the *Cubed* ecosophy enables a range of simple rule-based activity games for single, and multiple players, working either individually or in teams, both cooperatively and competitively. Its high level of portability has a particular impact on the sorts of environments the device can be used within, and this encourages a free ranging and exploratory approach to gaming. Coupled to this is the systems uniquely tactile and kinaesthetic interface. Each cube has a certain weight, (320 grams) making it an object with real physical heft. Each cube measures $8cm^3$ and therefore fits snugly into the hand and is easily carried, while two do not so readily offer this possibility. These particular affordances and the environmental and physiological couplings they allow enables *Cubed* gameplay to take place in a variety of settings: from traditional playgrounds, to less obvious environments. The system has been successfully trialled in a number of settings, and has proved to be engaging with audiences ranging in age. It has been made use of in various settings where art festivals and arts outreach events have taken place including: a museum, converted farm buildings, and a repurposed railway station waiting room. Functionally the system is purposefully severely restricted. Both the nature of its denotative ability (nothing other than the signalling of colour), and its ability to execute tasks (the potential to change that colour upon contact), are very limited.

If we consider the position of such a system on a plane of ludic functionality and affordance, while *Cubed* might be somewhat lacking in functionality, it could be argued that it's particular capabilities – how it is handled by players and how it can be used in different environments – is quite unique, offering both an exploratory approach to gameplay and the potential for further development. The devices

themselves might even be described as nothing more than scaled up interactive pixels. They offer no screen and no sound, and neither are they connected to the Internet. Such a list of components and functionality would seem to be the very minimum requirement of today's smart phone, the device that is for so many now their principle cybernetic extension; yet *Cubed* makes a positive attribute of its minimal feature set. It successfully works a novel assemblage, to elicit a free-flowing and creative approach to gameplay amongst participants. The system's autopoietic futurity is also pre-programmed. *Cubed* has the potential to provide its users with the opportunity to create their own games and store their rules within its circuitry. *Cubed* can be further developed through the creation of an online community utilising social media in order to share these games and provide a map of their distribution.

Prior to the countrywide examination carried out of children's games in the book *Children's Games in Street and Playground* by Opie and Opie (1969) there did not exist so full a survey of these game's variety and geographical range in the United Kingdom. With games such as: Block, British bulldog, and others, the Opie's discovered wide degrees of similarity and variation in the types of games children played across the country. Interestingly they describe such processes as "mutations" (Opie and Opie 1969:8) and note that the games children play are subject to continual historical change, with different games falling and rising in popularity as they are taken up by new generations of players. Similarity and variation exist geographically in both the naming of different games and the rules of their play. Names such as for instance: Tig, Tick, Tag, Touch, Tip, and He, being attributed, in different parts of the country, to what is the same game. These variations and fluctuations that the Opie's relate in their book with the aid of an image of a map

could very easily, from the contemporary perspective, be described as a network, and such a network is explicitly diagrammatic, in the sense that Deleuze and Guattari (2004: 123-165) define this term.

Of major interest to the Opie's is the changes in patterns of use that occur temporally, but the similarities and variations that they discovered in the geographical distribution of certain games point to other particularities regarding their spread. Any movement across these geographic spaces might be apportioned to other drivers such as word of mouth communication, but these practices could also be transmitted through their actual playing. The sharing, and playing of games with others from outside of one's immediate peer group would then spread them into what we might call (loosely aligned) virtual networks. Such networks are the ecology of *Cubed*, and its haptic interface makes them explicit by giving them physical embodiment. If, for the Opie's "Where children are is where they play" (1969:10) then this play can be described after De Certeau (1984) as part of children's 'everyday practice'.

In *The Practice of Everyday Life* De Certeau (1984) seeks to make explicit modes of operation, the many ways of manoeuvre that compose complex sets of practices, by which user's re-appropriate spaces primarily organised by techniques of sociocultural production. There is a sense in which, through practices of play particular networks with singular and distinct properties come into being. These networks can be described in many ways, including: the terms of their topography, the types of communication that take place within them, and the techniques they utilise for the storage of information. A topographical description would account for their geographical spread. A semiotic of these networks would describe how communication takes place within them, and clearly this transmission of information

has a performative aspect. Information would seem to be stored in both the minds (a memory of the rules of the game) and the bodies (proprioceptively as muscle memory) of its players. A virtual and nationwide networked culture of playing, with local groups and individual children not particularly interested in or aware of their positions within it. The Opie's findings seem easily equated with De Certeau's (1984) 'repertoires of schemas of action', which he defines as the articulation of replies with respect to particular circumstances, responses which help form relations between partners as a practice of space.

The tactical decisions made by those at play, and the techniques of the games that they enact could also be described as bringing into being in De Certeau's (1984) sense, new spaces. *Cubed* offers just such possibilities to create novel spaces and relations; and these spaces and relations are born out of its very performance.

There are innumerable practices by means of which people re-appropriate spaces that are already organised by techniques of sociocultural production. De Certeau (1984: xvi) asks: “What are the creative, clandestine, dispersed, and tactical procedures of consumers that compose the network of an 'antidiscipline'?” I would argue that certain types play could be described in just such terms. *Cubed* invites its recipients to take part in activities not always formally sanctioned to take place in these settings. Treasure Hunt for instance, (where a players’ objective is to find cubes hidden in the local environment that matches the colour of their own) is one game in particular that requires its players to traverse and reconfigure a terrain. In De Certeau’s (1984) terms, to turn the suggestion of the stability of ‘place’ into a ‘space’

Such space is “actuated by the ensemble of movements deployed within it” (De Certeau 1984: 117), and these movements acquire the quality of performance. Cubed performed by engaged recipients, through the act of play, changes, operates

by recoding, captures the surplus value of existing codes and in so doing "deterritorializes" (Deleuze and Guattari 2004:320) the space. Play as the deterritorializing element takes on the role of expression, the content of which is provided by the deterritorialized institutional space.

Deleuze and Guattari (2004: 342-386) argue that the territory is a place of passage, the first assemblage, and the passage of the refrain. The refrain is a territorial assemblage, it is "any aggregate of matters of expression that draws a territory and develops into territorial motifs and landscapes" (Deleuze and Guattari 2004:356). For Deleuze and Guattari (2004:15) any assemblage is divided along an axis of its territoriality, and also its line of deterritorialization. These lines are varied, and some open the assemblage up onto other assemblages.

If refrains alter the becoming of the subject, they are also a way to connect the actual and the virtual. Anna Munster (2013:191) in her writing seeks to reactivate the relationality of the network. For her this is a collective and 'contraptionist' reinvention of ourselves in our relation to technology. Munster (2013:109) argues that it is with the refrain that one milieu is transduced into another, as something passes between everyday vitalities and networked media. The refrain moves affect around, bringing about the dynamism of relations between planes of the living and the nonliving, art, technics, and temporalities. For Deleuze and Guattari (2004) whenever there is transcoding a new plane is constituted as a surplus value: "a melodic or rhythmic plane, surplus value of passage or bridging" (Deleuze and Guattari 2004:346). Refrains are rhythmic transductions that enable the creation of new milieu. The playing of playground games can be described in terms of the refrain: an aesthetic expression, an engagement with the infinite though which different domains are deterritorialised and reterritorialized and through which new

subjectivities become. *Cubed* seeks to transduce forces of playful affect. It does so in its enunciation, by singing its refrain, in creating a resonant field across domains, in the creation that is the becoming of its human technical assemblage. *Cubed* connects aspects of the ludic apparatus of desire, bifurcating and subjectifiying as it extracts a territory and constructs its milieu: an aesthetic, human / technical network.

To adapt another of Deleuze and Guattari's (2004) notions, such assemblages that *Cubed* helps produce, consisting of players, gaming objects, and the relations between them; could be described as nomadic play machines. While using the behaviours that these systems solicit to develop new terminology it is also worthwhile to reflect upon the etymology of some key notions, such as 'play' and 'game'.

Many languages do not differentiate between the term's 'play' and 'game'. The French word 'jeux', for instance is used to signify both activities. English however does make a distinction, and if games have rules, then play might be described as a more freeform and open behaviour. We therefore have something of a conceptual dichotomy: game/play, and this is disjunction that I explored in an exhibition that I curated of the same name (Askham 2006). *Cubed* and *Aquaplayne* can be delineated as sitting on either side of this construct. Whilst *Aquaplayne* can be described as a container for playful behaviours, *Cubed* is conceptually formalised as a container of games and game rules (something of a digital compendium), that its recipients can theoretically build upon. *Aquaplayne* enables and presents free-flowing play type behaviour, whilst *Cubed* makes use of different sets of clearly defined game rules to be effective. *Aquaplayne* has a clearly defined territory, *Cubed* is mobile and deterritorialising in its effects. *Aquaplayne* requires careful installation in controlled spaces, *Cubed* can be played within diverse environments at a moments' notice.

Inasmuch as *Cubed* is a project that develops out of *Aquaplayne,* it seeks to build upon its concept, enabling and capturing new and more sophisticated interactions and engagements that its predecessor did not direct. In so doing though it might be argued that *Cubed* as a finite state machine (Askham and Hastilow 2010) restricts spontaneity in its recipient's actions, and curtails any serendipity in their performance. *Aquaplayne* as a carefully constructed, simple use installation can enable spontaneous behaviour, whilst a highly portable set of networked devices such as *Cubed*, in facilitating various rule-based interactions, asks recipients to take part in much more prescribed activities. Computer based technology and rule-based gaming are clearly very well adapted to one another. Such connections can be traced back to Cybernetics, the expanded discipline out of which developed: game theory and - as has been argued by Johnston (2008), Liu (2010), and Watson (2008) - Lacan's psychoanalysis. Lacan's work has been influential both in the development of game theory and Guattari's metamodeling techniques.

*An Englishman's Home Is His Castle* (2011) is a site-specific project proposal that engages with 'machinic' processes of entropic decay in contemporary technological society and explores themes of defence through the particular configuration of my artistic practice. In March 2011 the organisation East Artists put out an open call for proposals of projects that it might support on site at Jaywick Martello Tower on the Essex coast. Jaywick Martello Tower is one of one hundred and three Martello Towers that were erected around the coast of England to defend against the threat of Napoleonic invasion in the early 19th Century. Many of these towers are now regarded as worth defending themselves, both against the ravages of the sea, and also their inappropriate re-development. The Martello Tower at Jaywick in Essex has been incorporated as an arts, heritage and community space, and among

other facilities has a temporary arts space.

My proposal in response to this call sought to explore the term 'defence' in relation to Jaywick and the configuration of the settlement as an historically, socially, and ecologically contested space. The Martello towers were originally erected to defend against foreign invasion, and now require defending themselves, both against the consequences of environmental factors and – as sites of architectural interest – unfettered redevelopment. The town of Jaywick itself has in the past been inundated by the sea. The catastrophic results of these floods have required that costal defences be built and maintained. Jaywick is also a community that feels the need to defend itself politically. Houses that were constructed originally as holiday homes for Londoners have over time become more permanent residences. While this process was partly enabled because of poorly enforced planning regulations, at the time of the commission permissions to build were no longer being granted, even on the sites of demolished homes. As Tendring, the local district council, attempts to return some of Jaywick's spaces to their former, 'green' condition it can be argued that th e community of Jaywick is existing 'under erasure' and that this process is being driven by both political and environmental factors.

In my written proposal I discussed Gilbert Simondon's, (1958) ideas of technical operations, and his major philosophical contribution: his detailed examination of the conditions of individuation. I quoted at length from Simondon's (1964) *L'individu et sa genèse physico-biologique*. Highlighting how his critique of hylomorphism might open the way for an arts practice to present any given form/matter couple in its own particularity: as a singular event. Simondon (1964) argues that in stepping back from the hylomorphic mater/form binary, we might examine how technical operations can prepare transformations that meet at certain

points and transport potential energies:

> "in the technical operation which gives rise to an object having form and matter, like a clay brick, the real dynamism of the operation is extremely far from being able to be represented by the matter-form couple. The form and the matter of the hylomorphic model are an abstract form and an abstract matter. The definite being that one can show, this brick drying on this board, does not result from the union of an unspecified matter and an arbitrary form. If one takes fine sand, that it is wet and then one puts it in a brick mould: with the release from the mould, one will obtain a sand heap and not a brick" (Simondon, 1964).

The creation of a brick provides a simple example of how abstract form and matter come together in the hylomorphic model. A brick, being the non-reversible product of a particular set of circumstances and processes, exhibits and embodies a completely new set of useful properties as a result of these operations. I pointed out in my proposal that there is a particular name that we can apply to the process – which Simondon analyses so precisely – of placing fine wet sand into a mould: making sand castles.

For *An Englishman's Home Is His Castle* I proposed that I would create a model of the Jaywick Martello Tower. Starting with a virtual 3D model of it and then using this to produce a physical model utilising Selective Laser Sintering (SLS) techniques. The model would take the form and be at the scale of a bucket. This bucket would be produced in the style and colour of a toy, a seaside 'bucket and

spade' type receptacle. This bucket was to be used to make sandcastles, utilising sand from the local Martello Beach and these would be exhibited, together with the bucket itself inside the temporary art space at Jaywick Martello Tower.

The sand castles were to be created and installed at specific time intervals, prior to exhibition and positioned in a row in the gallery. The water that bound their structure would evaporate over time, causing the sandcastles form to decompose. This would have the effect of turning the sandcastles into little piles of sand. The process of this entropic decay would be presented to visitors to the exhibition as each castle would be at a different stage of disintegration. Theoretically this would range from one end of the installation where the audience would find a perfectly formed impression, to the other, which would consist of a completely undefined heap of sand. There is the potential for this temporal process - depending on how it is presented or cognised - to be perceived as occurring in one of two directions: the castle either deteriorating, and collapsing into a pile, or growing grain by grain, emerging fully formed, autonomously within the gallery space.

Conceptually the piece takes a playful approach. The instantiation of the sand castles in the singularity of their matter and form couplings physically embodies the community of Jaywick's distinct set of material conditions. Specifically, these conditions are the reality of Jaywick as a seaside community, whose temporary holiday residences have become more permanent over time. Furthermore, the piece presents these homes as existing in an embattled condition under the pressure of political and ecological erasure. This being a twofold process: driven on the one hand by the political agency of Tendring District Council, and on the other, by the ecological forces of the North Sea. The work thus combines political and ecological concerns. The bucket and sandcastles presenting the tower as a figure for the wider

community: one that is embattled and the plaything of powerful external forces.

*An Englishman's Home Is His Castle,* in comparison to the other projects discussed here, takes the form of a more traditional art installation with its own site-specific materiality. The piece uses play as metaphor in order to conceptualise notions of place and belonging as well as presenting the political and material forces that shape these ideas. It makes material reference to beach holidays, which many people both young and old have memories and experiences of. These notions of play, rather than being explored interactively, are exploited for other means. The installation provides an opportunity for audience reflection upon the transitory nature of human settlements, the changing nature of their existence, and the forces that effect these changes.

*An Englishman's Home Is His Castle,* like *Aquaplayne* and *Cubed* before it could be described as a container (how else to comprehend a bucket?), *Aquaplayne* can be described as a container of performance, a device that both solicits and presents active physical behaviours. As with *An Englishman's Home Is His Castle, Aquaplayne* uses metaphor. The rippling surface of its pond, while visually from a 'natural' register, is used to reveal the meniscus of human computer interaction. With consideration it would seem to pose the question; are computers instrumental in a human 'fall from grace'? Or alternatively, are they an extension, a development of our 'natural' state? *Cubed* is also a container, a repository of game rules. *Cubed* is also a project that is purposely pared back to a very simple level of signification and functionality.

Almost at the level of a “primitive presignifying semiotic” (Deleuze and Guattari 2004: 68), *Cubed* is decidedly non-metaphorical in its conceptual construction, existing as art, as Luhmann (2000) argues, self-referentially; it's only

purposeful reference being to itself as a new distribution of content and expression (Deleuze and Guattari, 2004). *Cubed* offers a unique assemblage of forms and substances, a crossing point that produces its own uniquely singular relay. *Cubed* furthermore works as a hand-tool couple in Leroi-Gourhan's (1993) sense, the combination of which produces its content in its assemblage. If, as Leroi-Gourhan argues: evolution is now about the exteriorisation of the brain, a situation whereby "technical liberation unquestionably reduces the technical freedom of the individual" (1993:253): for him the importance of the hand is in decline. Its activity though, he argues, is closely related to the balance of the areas of the brain to which it is connected. If no longer having to 'think with one's fingers' "is equivalent to lacking a part of one's normal, phylogenetically human mind" Leroi-Gourhan (1993:255), then *Cubed* offers something of a corrective to this condition. Both *Aquaplayne* and *Cubed* can be described as containers for novel physical behaviours.

Both *Aquaplayne* and *Cubed,* in the sense that they are containers that solicit such behaviour, could also be described as Systems Art projects. *Cubed* is a toolbox, one which with user engagement and recipient feedback has the ability to grow. As such it is, in Felix Guattari's terminology a 'collective assemblage of enunciation' (2000:44), For Guattari (2009) the notion of assemblage problematises notions of enunciation and how a subject is constructed. Assemblages for him join together pre-personal traits with social systems and their machinic components. *Cubed* makes productive use of the pre-personal trait that is playful behaviour and the project presents these in its construction to its' socially engaged recipients. It is tempting to describe *Cubed,* when its recipients are fully taken into account as part of its system, as self-organising and autopoietic in the expanded socio-technical sense of the term. In a development of Luhmann's (2000:245) notion that "observations of art occur

only in the autopoietic network of the art system", *Cubed* includes an actively engaged audience in its production, and not just in its contemplation upon presentation. The content and expression of *Cubed* is closely aligned.

*Cubed* comes about in its singularity when it's forms of expression are extracted from unformed particle signs. It is possible to describe the particular combination of its components, the regime of signs of *Cubed,* diagrammatically. For Deleuze and Guattari (2004:145-6) the diagrammatic gives a name to the extraction of forms of expression from particle signs, and this for them is a process that is both the height of abstraction, and the moment at which abstraction becomes real. The collective assemblage of enunciation that *Cubed* expresses is a subjectification, an assemblage that names the formalization of expression of a particular regime of signs. The semiotics that *Cubed* presents are those of a 'nomadic play machine'. Such are its arrangements and distributions that operate through modulations within it and through movements across a territory. These are the unique procedures of subjectification of *Cubed*, which offers, after Deleuze and Guattari (2004:154) a 'generative practice'. A pragmatic approach is one that has two aspects: generative and transformational. Generative pragmatics show how different abstract machines form concrete, mixed semiotics. Transformational components show how these regimes of signs translate into one another. "Generative pragmatics makes tracings of mixed semiotics; transformational pragmatics makes maps of transformations" Deleuze and Guattari (2004:154).

**Conclusion**

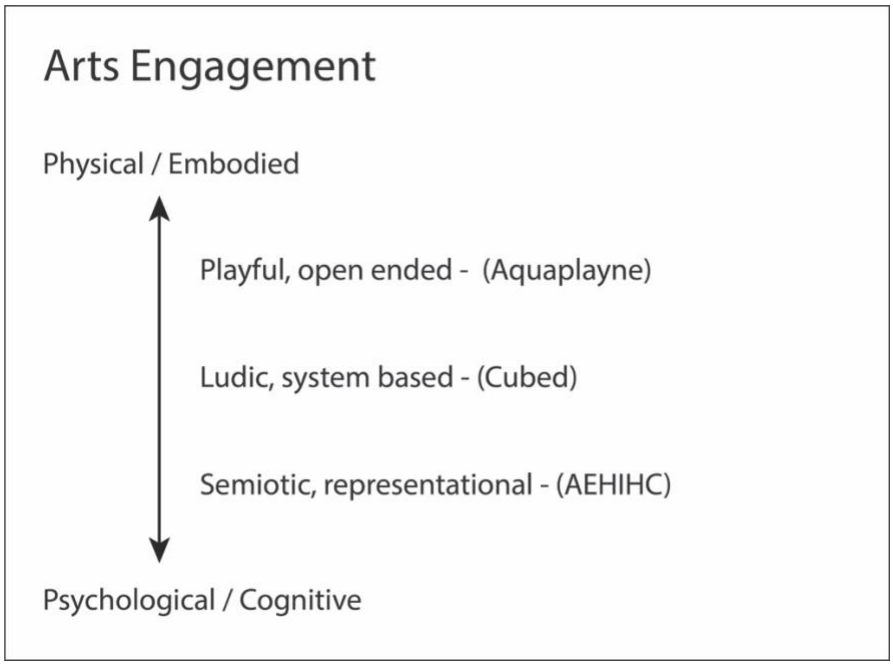


***Figure f) Arts Engagement with its audience. Giles Askham***

A line (fig. f) can be drawn that considers the three projects discussed here in terms of the primary means that their audiences and recipients engage with them. In mapping the ways in which someone might be a recipient of a work a line of interaction emerges that ranges from the primarily cognitive, cerebral and reactionary at one pole of an axis to the physical and bodily engaged at the other. This line can be formulated as intersecting different ludic planes, and the works themselves can be positioned at intervals along it. An installed, non-interactive artwork like *An Englishman's Home Is His Castle* (AEHIHC) requires a degree of cognitive engagement if its audience is to fully appreciate it. Its conceptual puzzle, while not particularly difficult to solve, requires a degree of theoretical engagement, along with a playful consideration of metaphor and an ability to glissade through different levels of signification to fully construct its meaning in the abstract. While

*Aquaplayne* makes use of metaphor, audience members are invited to 'jump in', to engage on a fundamentally somatic level with the project: to experience their physicality and to explore playful behaviour in becoming its recipient's. Despite the fact that *Aquaplayne* provides a stage for the presentation of such behaviours and enables many recipients to experience it simultaneously, the nature of the acts that it facilitates tend towards a type that aligns an individual into a position of awareness of their own physicality, and is thus primarily a discrete individuation. *Cubed* might be positioned on a plane somewhere between these two other projects, and the requirements it makes of its recipients would appear to be more complex. In order to fully engage with *Cubed* a recipient must utilise compound physical skills, elaborate cognitive ability, and finely developed social skills. Perhaps this is why it is so engaging; in fully occupying its recipients in playful behaviour the dualities of mind / body and social / psychological are diminished.

In his late work Postscript to Societies of Control Gilles Deleuze (1992) understands how under the auspices of computation societal control becomes modulated. Yuk Hui (2015) in his essay Modulation after Control claims that this writing reveals something of an internal contradiction in Deleuze's work, and shows how modulation provides a particular mode of disindividuation in control societies. Hui (2015) argues that both Deleuze and Simondon developed a metaphysics that makes a particular social and political transformation visible. For him "The substitution of hylomorphism based on moulding with a theory of information and intensity based on modulation, renders visible a social and political reality of our time: the emergence of new patterns of regulation and governance which Deleuze ultimately names with his concept of 'control societies'" (Hui 2015:83). In contradistinction to this definition of modulation as an emergent model for

mechanisms of social control, Hui offers an alternative. He argues that what Deleuze and Simondon actually provide is a theory of ontogenesis, based on the notion of modulation: of being *qua* becoming. Hui (2015:86), contends that such metaphysical thinking can develop new types of modulations, not merely ones which aim to control, but ones that facilitate individuation, democratic group formation, and collective engagement. I posit the *Cubed* project as an example of this new type of modulation, an interactive contraptionist device that enables the production of refrains through its non-alientating engagements with its recipients, it helps create new line of flight and individuations.

Deleuze and Guattari (2004: 342-386) argue that the territory is a place of passage, the first assemblage, and the passage of the refrain. The refrain is a territorial assemblage, not limited to song it is "any aggregate of matters of expression that draws a territory and develops into territorial motifs and landscapes" (Deleuze and Guattari 2004:356). For Deleuze and Guattari (2004:15) any assemblage is divided along an axis of its territoriality, and also its line of deterritorialization. These lines are varied, and some open the assemblage up onto other assemblages. For Deleuze and Guattari (2004:347) territories emerge as matters of expression when rhythms become expressive, when milieu components cease to be directional and functional and instead become dimensional. A territory is marked therefore when the refrain acquires a temporal constancy, and a spatial range. Guattari (1992: 20) argues that refraining creates "virulent, partial fragments of enunciation operating as shifters of subjectivation." In differentiating his schizoanalysis from Freudian and Lacanian psychoanalysis, Guattari (1992) describes Freud's Fort Da game as an example of a refrain. In so doing he posits the refrain as a process of "the continuous creation of the self, a process of permanent

autopoetic renewal" (Guattari 1992: 74-5). For Guattari (1992:75) "Fort is chaosmic submersion: Da the mastery of a differentiated complexion. Sauvagnargues (2016:128) points out that this figure of the refrain shows it to be: "an action conducted for itself as an affirmation of an individualising response of the child to his universe". For Sauvagnargues (2016) Guattari's Schizoanalysis rejects the destruction of the ludic apparatus of children's desire, instead it articulates the question: how do we assume consistency? The answer for her is: "Through the rhythmic game by which we extract a territory from a surrounding milieu" (Sauvagnargues 2016:128). Sauvagnargues (2016:131-3) reminds us that it is a question of becoming, not of imitation or identification, and refrains ensue by a process of cascading deterritorialisations. Chaos becomes rhythm in in-between spaces. For Sauvagnargues (2016:134) a path is created that crosses milieu and transcodes (we might say transduces) them, rhythm therefore exists as soon as there is heterogenesis between milieus.

The encodings that *Cubed* enables I argue exist between form and matter, but without leaving the planes of content and expression, they are transformational and pragmatic, they can be described as a-signifying, and deterritorializing, and as such release abstract machines. *Cubed* presents a finite state machine as a means with which to develop lines of flight, to deterritorialize existing spatial, physical and psychological formations and strata, in order to enable the production of new becomings. In opening up ludic planes to creative production, I posit *Cubed* as an example of a project that substitutes the hylomorphism of the substantive form / matter coupling, with a modulation that expresses the processual sense of individuation as transduction. The emergent tensions set up by *Cubed* are partially resolved in a metastable state. The mechanisms of *Cubed* modulate its relational

aspect by setting up creative constraints. Making, playing with, and thinking about *Cubed* has enabled me to create an analogic ontological knowledge: articulating being as a disparate relation of difference, disjunction and transduction, and to develop possible openings onto the virtual and creative processuality.

Cubed provides opportunities for the performance of an 'everyday practice' (De Certeau 1984) The aesthetic of *Cubed* is created through a playful engagement with technology, in constructing a field of resonance, contra exploitative and hypostatised teleological technical culture. It offers opportunities of resistance, and affords tactics for the avoidance of being reduced by De Certeau's (1984:32) "primarily regulatory field of technocratic rationality."

If there is a networked structure, to the mesh of human reality, (Simondon 2010). Is it possible to figure an assemblage that does not solely consist of concretized technical objects? There is a level of indeterminacy, a margin of indetermination even, explicitly enabled by the design of technical objects such as *Cubed*. These approaches enable human technical ensembles and reticulations that are flexible and open, creating milieu that are less alienating by design.

For Combes (2013) Simondon's associated milieu is the space where non-dialectical duality emerges. The relation between individual and external is these two milieus taken together in their association. Internal and external are not absolute, they are instead metastable, relative to one another in their dynamism. In order to think these different modes of existence analogically (as opposed to metaphorically) the individual needs to be considered as an "energized topological configuration … and a plane of disparation crossing orders of magnitude." (Combes 2013:88-89). Being individuates into metastable systems and associated milieu, through

transductive processes of asymmetrical internal resonance (Such processes can even define the leap from the chemical to the living).

If as for Simondon (1958) alienation comes about when culture fails to include the technical milieu in its attempt to solve the problems posed by the organic milieu; then the bringing together or convergence of the technical and biological milieu in Technical Objects does not ignore the physicality of their being of relation. While Hui (2016) argues that purely digital objects are not objects of cultural memory, physical computing systems like *Cubed* that are analogous to children's building blocks have a heft, they can be held and manipulated 'naturally' in the hand, they afford a full body engagement and establish a relationship between objects in diverse environmental spaces, as they catalyse their physicality in the production of their machine of expression (Guattari 1992).

For Munster (2013), we experience not change, but changing, transductions that occur at the human level of the relational experience of art works. Munster (2013:158) describes the transductive aesthetics of certain art works as "generating experiences of modal and temporal transition". *Cubed* after Munster (2013:194) is a contraptionist device, for creating material diagrams that effectuates technique and process to provide a different kind of technics. *Cubed* is a relation of relations, the production of an associated milieu of play. This disparation, at the edge of an analogical encounter between different modes of existence is the outside of two sets of transductions occurring on the inside. One in the biological/psychosocial and the other in the technical. The mode of existence of Cubed is the manipulation of networks, a modulation of the digital as performative disparation. These networks combining in a physically actuated associated milieu, an energetic and highly charged phase of existence that is both novel and ripe with potentiality in its futurity.

De Certeau's (1984) 'futurology' seeks to explore the difference between tactics and the strategic representations offered to the public by the mechanisms of the microphysics of power as the product of these operations. In its futurity *Cubed* provides the structure of an amplifying network that may still be invented. *Cubed* produces a distributed network of relations between heterogenous elements of different types and kind: human and technical. The system exists to be played with. It is also designed to be developed, so that it might be used to facilitate, store, and share new games invented by its players. The intention of allowing recipient's the ability to add games enables these heterogenous elements to undergo further transductive translations. Through their relations, their participation in collective individuations, their couplings and articulations, in producing their associated milieu. The *Cubed* assemblage is ontongenetic in its organisation, and its recipients could one day shape its future functionality. *Cubed* in its' becoming, it's reticulation of humans and technics, being its own final cause, a retrieval of the world from its objectification in logical thinking.

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**Appendix – The making of Cubed**

While the work of this thesis makes use of Barrett and Bolts' (2007) conceptual model of practice-led research, this chapter will adapt Skains' (2017) Auto-ethnomethodological approach in analysing that work. It will study the practical development and presentation of an art & technology project *Cubed*, which materialised over the period 2009-12. In a foundational relation to this writing, the work on *Cubed* helped shape the practice that has led my research. This chapter will describe the many actors and stakeholders involved, discuss the network of support and funding that I, as principle creative practitioner set in place and in motion. It will furthermore analyse the different – and at times contradictory outcomes and ends that these various individuals and agencies sought the project to achieve. Bruno Latour (1999) the philosopher of science and technology is not much interested in that which is already firmly established and canonical in any given discipline. Instead he likes to apply the strategy of studying science and technology in their actual making; analysing social and scientific processes, examining the actors, policies and networks involved, before technological black-boxes are closed and hidden from view. In taking an Auto-ethnomethodological approach this chapter will invoke Latour's (1999) and Skains' (2017) research methodologies.

Skains (2017) adapts practice-related research and Ethnomethodology (Garfinkel 1967) as a method of studying the making of art. If as Garfinkel (1967) argues, the organisation of social life is produced via the work of its members both through and in the moment of its occurrence, then this is an explicitly reflexive phenomenon. Heritage (1984) points out the importance to Garfinkel's research of the concept of reflexivity. For him it is a description of the way members of any

given social group shape their action in relation to its context while the context itself is constantly being redefined through that very action, and also by the use of indexical terminology. The process of autotomising this methodology – autoethnography – if carried out carefully, is therefore not much of a contortion of the original concept. Autoethnography is in fact a methodology ideally suited to the study of one's own work, particularly if that work is creative in nature. For Skains (2017) practice-related research has established itself as a tried and tested methodology in many disciplines including: medicine, design, and engineering. In her own research she adapts these techniques, turning the practitioner's interest onto their own activities: "Practice-related researchers push this examination into a more direct and intimate sphere, observing and analysing themselves as they engage in the act of creation, rather than relying solely on dissection of the art after the fact" (Skains 2017).

In examining the *Cubed* project as a technical assemblage (Simondon 1958) this chapter will follow Bruno Latour's (1999) principles of studying science in action. Specifically, it will examine the processes that occurred prior to the system becoming black-boxed. It will examine the communications between key actors, correspondences that took place via email, and documented conversations that occurred during meetings. It will look at the transformations that the project underwent as a result of the actions of its many identifiable actors and agencies. Through this multifaceted arrangement of individuals and agencies I created a singular network. In attempting to produce specific outcomes, I fought to hold in place a complex assemblage. The components of this aggregation had many (often paradoxical and conflicting) needs and desires, and they all needed to be considered and taken into account.

The *Cubed* Project (2009-12) came about through the associated interactions of a network of related individuals each with particular skills, and was sustained by numerous funding and support agencies. As the central contributor in this endeavour I brought these participants on board and placed them into loose alignment, arranged around the project, and its aims and objectives. My personal art practice (described in more detail in another chapter of this thesis) at the time was concerned with notions of Human Computer Interaction (HCI). I was creating technologically enabled artworks that utilised haptic, and full body engagements in a playful exchange with participants. I was seeking to establish settings, framed experiences. These works positioned participants as 'recipients' in Kwastek's (2013) sense of the term, and sought to enable them to reflect upon their relationships with technology. While my previous art project *Aquaplayne* utilised a low-fi, and low-tech approach to its development, it had still been necessary for me to make use of specialist support to overcome technical issues in its construction. The learning curve had been steep and I realised that projects of this type were only successful when dedicated and expertly talented teams of people came together to work on their production. Teams that were able to work in common interest, on specific and qualified outcomes, and towards the realisation of shared goals.

There are many reasons why the *Cubed* project came about, and to make this so I was able to effectively utilise many support networks and funding opportunities. As an academic I was able to call upon the critical support of my peers and the technical facilities of my institution. As an artist I was able to construct a discourse that was mounted to persuade more than one funding agency of the efficacy of the project, and I was also able to present it as such at many art symposiums, festivals, and international conferences.

Clearly the success of projects such as these require many engaged participants. The Design Art and Media Technology Action Group (DAMTAG) was a forum convened by Maureen Kendal together with other colleagues from across different academic departments at London Metropolitan University that was highly supportive at a critical, formative stage of the project. DAMTAG consisted of people I already knew: Fiona French and Alan Hudson, from the School of Computing, alongside others: Chris Lane, and Elena Moschini, from the School of Social Sciences, with whom I would go on to work later, as well as colleagues from the CASS School of Art including: Luke Hastilow and Lewis Jones. The group was a collection of individuals who shared an interest in media, art, and technology, and were frustrated with London Metropolitan University's perceived inability to engender interdisciplinary, and cross-faculty working on innovative projects. The group caused quite a stir at the institution, and attracted the interest of senior managers for a while before eventually being closed down. It was through this forum that I met Luke Hastilow who went on to become co-creator of *Cubed*. Luke worked as a 0.4 Lecturer in Music Technology Audio Systems at the CASS School of Art. He was a talented electrical engineer and programmer, and wanted to work collaboratively on art and technology projects.

At the time of the genesis of the project there was a general interest in technological engagements that went beyond the mundanity of sedentary desktop computing. Artists including Rafael Lozano-Hemmer, and academic departments such as MIT Media Lab were pushing the technological boundaries of interaction. At the same time developments in telephone and network technologies were occurring

that were bringing about the birth of mobile computing[2]. It was a period of great interest and excitement about future technologically enabled possibilities, while at the same time there existed concerns about sedentary lifestyles (Office for National Statistics 2011) and idle behaviour types that excessive technological engagement was seen to be inducing. The period 2000-09 saw a steady year on year increase in levels of arts funding in the UK (Dempsey 2016). National lottery funding, allocated for the UK national government by The Arts Council peaked at around £500m in 2008. Much of this increase in funding was used for experimental projects and was allocated to organisations who were interested in engaging non-traditional audiences in innovative ways and in unconventional venues. I had personal experience of this new funding regime, having successfully set up and led an art organisation, Peterborough Digital Arts (PDA) between 2003 and 2004. PDA had largely been paid for by Arts Council England (ACE) capital funding provided for by the National Lottery Arts Fund. Many arts organisations with an experimental remit were able to tap into these new resources to fund exciting and innovative projects. One of these was Folly, (1989-2011) an arts organisation based in Lancaster.

Folly specialised in interactive digital arts projects and looked to take these outside the white cube of the traditional art gallery space. Folly secured ACE and National Lottery funding for a project they named 'Portable Pixel playground' (PPP). They described PPP in artists calls for projects as "a unique and imaginative environment that offers children and young people alternative play opportunities with art and technology. The playground encourages children to get active, think differently, collaborate and take risks through being exposed to new concepts and

[2] 2007 saw the launch of both Apples first iPhone, and Google's Android operating system for mobile devices. See https://www.cs.odu.edu/~tkennedy/cs300/development/Public/M01-HistoryOfMobileComputing/index.html for more information

challenges created by artists." (Folly 2009). PPP appeared to tap into the set of perceptions that circulated around notions of the negative impact of the sedentary use of technology. It also seemed to me to chime conceptually with my own arts practice and so I decided to apply. Folly were offering a small production budget, alongside project support, and very importantly, a platform from which to showcase new projects and raise awareness of the possibilities that alternative technological engagements could avail.

By the time I saw the PPP call advertised Hastilow and I had developed a working relationship. I was drafting a proposal for a degree in Tangible Media / Physical Computing that I was hoping the School of Computing at London Metropolitan University would be interested in running. I was discussing with Hastilow possible curriculum content, and his teaching input. I saw this development as having the potential to provide an opportunity to further integrate him into the academy and secure his employment and with it his highly sought-after and singular skillset. We had also been collaborating on an arts project 'The Thing' that DAMTAG member Lewis Jones had been able to secure a small amount of funding for through a London Metropolitan University funding stream called The Research Capability Fund. We had enjoyed this experience and now felt ready for a more substantial project. I discussed my ideas for the *Cubed* project with Hastilow, and while he was initially apprehensive about its technical practicalities, I was able to persuade him of it's worth and eventually he agreed wholeheartedly to get involved as the project's hardware and software developer.

I drafted a proposal and after discussing this with Hastilow emailed it in June 2009 to Clare Gannaway at Folly. We were very pleased when within only a couple of weeks Gannaway responded to our application and asked us to travel to Lancaster

to discuss the project in more detail with her and Taylor Nutall, Folly's chief executive. It was clear from this meeting that they were very keen to commission us, that they wanted to take the opportunity to find out more about us and our working relationship, and discuss the finer points of the project. From our perspective we wanted to know what support Folly would offer, what deadlines we were working to, and with whom any potential IP who reside upon completion of the project. The meeting was very successful. We were to receive funding, (£4,000) and project development support from Folly. They would also provide us with opportunities to showcase the project, both through their PPP venture and also potentially at a forthcoming Arts Festival, Abandon Normal Devices (AND) taking place at Grizedale Arts in the Lake District in April 2010. We would also retain the projects IP, this meant that theoretically the project could have a life beyond the work we completed for Folly and might attract further additional funding at some point in the future.

With Folly's support secured it was now time to swing into full production mode. Given the fact that Hastilow was to develop the electrical and software components of the project, and the large amount of time required to complete these tasks, it was decided that he would receive the lions' share of the fee (2,000). While Hastilow began his development, my task was to investigate the materials that could be used to create the casings that would house the cubes actuators, circuitry and sensors. To that end I arranged a meeting with my colleague Dr Mathew Philip who was Academic Leader of Polymer Technology at the London Metropolitan University Polymer Centre. I discussed with him the pros and cons of injection moulding processes and while Dr Philip agreed that these had potential, there was a cost implication. Setting up and creating custom moulds was an expensive

undertaking, and given the fact that what we were constructing were essentially a set of prototypes it was deemed inappropriate. Dr Philip suggested an alternative material to consider was acrylic. Acrylic could be ordered in specific sizes and shapes (including cuboid forms) routed out to form simple box like structures, and thereafter drilled and bolted together. I was at this time still working on the project 'The Thing' and Peter Hufton, a woodwork technician at London Metropolitan University's Commercial Road site was creating a routed-out wooden housing for the project for me. I discussed the technical issues we were facing creating suitable housings for *Cubed* and he suggested he could use his wood-working router to shape acrylic. I was surprised that this was possible, but he was adamant that it could work. Hastilow and I decided to take him up on his offer, ordered some acrylic blocks and set him to work. In the mean-time Hastilow sourced the requisite electrical components, which I then ordered. He began work developing and printing Printed Circuit Boards (PCB's) for the cubes and also developed a programme that would enable them to function utilising processes including updating one another on their game states, and responding to these via a change in emitted colour. Once the components had been delivered, he soldered them onto the newly printed PCB's, and together we assembled the cubes, placing the PCB's inside the recently routed blocks, and securing them with coach bolts. Hastilow's work on the project was a mammoth task that took a great deal of his time. An enormous endeavour that he was ultimately successful in completing, and for which I remain truly grateful.

*Cubed* was now ready for Lab testing and In January 2010 we set up colour cube, a 'Simon says' type imitation game and asked people to play with it. This proved a great success (see: https://vimeo.com/10578258 for documentation) and we were now both very confident that the project could succeed. A trip was made to

Lancaster in March that year to test the project with the public at a PPP event, and it was then officially launched in April 2010 at the Abandon Normal Devices (AND) Festival in Grizedale Forest Park, Cumbria. Folly were very pleased with the project and it went down very well with the public, (documentation is available at: http://cubed-3.org/documentation/)

Phase one of the project was complete. With minimal funding and the resources of a small team we had successfully delivered on our aims. We had also submitted academic papers discussing the project and were subsequently able to present the work at several conferences including internationally at ISEA 2010 that August in Dortmund, Germany (documentation is available at: http://www.isea-archives.org/docs/2010/program/ISEA2010_Programme.pdf).

Both Hastilow and I believed that the project had untapped potential and we now sought new ways and means of developing a second, more technically sophisticated version. To that end we met with Matthew Lewis, manager of Metropolitan Works at the end of April 2010, to discuss the possibility of collaborating with them on the next version of *Cubed*. Metropolitan Works was at the time a full-service provider of rapid prototyping facilities to the private sector, based at and linked to London Metropolitan University's CASS School or Art. As Latour (1999, 108-124) points out, to build an engine, or a computer you need more people, more time, more money. Others need to be enrolled to participate in the construction of the fact, and their behaviour must be controlled in order to make their actions predictable. I was to discover that as networks grow, the work required to bring them into play increases, and their articulation can become increasingly unwieldly.

"The more involved the benchwork the more resources need to be brought to

bear" Latour (1999:155). The ability for Hastilow to continue to work on the project in his lab depended upon my capacity to collect new resources. I had to convince others that this work could be used to further their own goals. We now turned to our academy, London Metropolitan University, as a source of further support, and also for the first time, funding. We sought to develop new support systems and pursued new funding streams to help the project progress. From a technical perspective we wanted to create a more advanced system. This would utilise surface mounted electronic components (which miniaturised the electronics) and more robust, and attractively constructed housings. The surface mounted PCB's would be made to order from an external supplier. The housings would be created using the facilities of London Metropolitan University's Metropolitan Works computer numerical control (CNC) rapid-prototyping facilities. In order to fund this new program, we considered a range of alternatives: biding for Engineering and Physical Sciences Research Council (EPSRC) grants, as well as applying to the Emerald fund, and the Higher Education Innovation Fund (HEIF). After discussing these possibilities with colleagues across the university it was decided that HEIF funding presented the simplest route. Over time it became apparent that choosing the HEIF route meant that it would be imposing its' own particular set of requirements upon the project, conditions that effected *Cubed* in ways I had not previously imagined or considered.

The Higher Education Innovation Fund (HEIF) was first made available in 2001, that year it made 89 awards totalling more than £77 million to UK Higher Education Institutions (HEI's), (National Archives 2018). It continues its work to this day. HEIF provides funding in support of activities aimed to increase HEI's ability to respond to the needs of business, and to have economic benefits. As such HEIF support is described as 'third stream' funding, separate from an institutions' teaching

and research activities.

A bid was worked up for the fourth round of HEIF funding in 2010 which highlighted how further progression of the *Cubed* project would enable the continued professional development of Hastilow and myself and would also help develop expertise that could then be capitalised through Knowledge Transfer Partnerships (KTP's). Emphasis was placed on the fact that the project was a collaboration between three London Metropolitan University departments: The School of Computing, The CASS School of Art, and Metropolitan Works. I described how working together on design, electronics, and physical manufacture also provided a model of working that enabled curriculum development. I was at the time in discussion with Hastilow and Matthew Lewis the manager of Metropolitan Works, about potential cross-departmental masters courses in Tangible Media / Physical Computing and expected to work jointly with them on development and delivery of this initiative. The HEIF bid highlighted the fact that a paper on the project was to be presented at the International Symposium of Electronic Arts (ISEA) in Germany that summer (documentation is available at: http://www.isea2010ruhr.org/). As well as budgeting for costs against materials, components, and our time, there was also an allocation set aside for us to attend other European events such as Ars Electronica. The proposal was shown to Matthew Lewis, Dominic Palmer-Brown, Head of School of Computing and Chris Smith Head of CASS School of Art. Lewis and Smith were happy with the bid and Smith signalled that he was pleased for Hastilow to be involved. Palmer-Brown made a request for some alterations. He argued in an email that a HEIF application did not require the inclusion of curriculum development and recommended we seek to secure the intellectual property of the project for London Metropolitan University, and make this a key aspect of the bid. I

was keen to submit the proposal to Paul Lister, Deputy Vice Chancellor and so made the alterations he requested. Lewis took the bid forward to Lister and on 29th June emailed me to say that Lister had agreed. The next stage was to be funded by London Metropolitan University for the amount of £20,000

I had a project, one with its own fiscal code (U3379), and was now required to submit approval forms to the university's finance department. I needed to consider budgeting allocations, and oversee invoicing. I also had to discuss with my line-manager Peter Chalk, the time that he would allocate to me away from my other duties to work on the project. *Cubed* was now formally and officially part of my university workload. For Latour (1999: 141-160) there is a direct relationship between the size of the outside recruitment of resources and the amount of work that can be done on the inside. Just as he describes in *Insiders Out* chapter four of *Science in Action* (1999) the *Cubed* project was becoming part of a cycle, and my work on it was changing. I was less involved in the making of the project and was now more concerned with the construction of a new and more complex network. This network needed to be fully embedded within the larger community of practice at London Metropolitan University. It involved additional individuals brought into play by Metropolitan Works who had the necessary technical skills to construct the new version of *Cubed*. This including Marcus Bowerman, who would oversee the CNC work, (and was to later take over from Matthew Lewis as manager of the facility) and a freelance CAD worker, Dan Hidrupp. Other actors with new roles were also recruited. This including Dr Sue O'Hare, the newly appointed Associate Director of Enterprise. O'Hare was someone I sought to enlist to help me build new arguments for the success of the project. Her institutional role concerned the development of third-stream funding streams, and her primary interest in *Cubed* was

to secure and exploit its intellectual property by means of a successful patent application.

To that end O'Hare emailed me on 20th August (just prior to our trip to present the project at ISEA) to inform me that she had lined up a firm of patent agents named IP21, to look into the possible patenting of the project. She was trying to determine if the project had any protectable intellectual property, was keen to know what interest Folly might have in this, and wanted to know if anything had already been disclosed, either to Folly or more widely. I updated her on the projects' history, and O'Hare was unhappy that *Cubed*, having been presented at several festivals and conferences, was already in the public domain. In the transition between two funding bodies (ACE and HEIF) *Cubed* was morphing from an innovative arts project into a potentially patentable product. The fact that it had a history did not help smooth the passage of its new course of travel. This was not a direction I had initially imagined it taking, and I felt as though I was losing control of the projects' potential and trajectory. Meanwhile on the production front things were inching forward.

By the Autumn of 2010 work was slowly beginning on version two of *Cubed*. The processes involved in organising the project were becoming quite tortuous. The fact that Hastilow and I worked in different schools did not help with the allocation of HEIF funds against our time, and the institutions slow response in organising travel and accommodation meant that we had to postpone a planned trip to Ars Electronica that year.

There was some debate and disagreement between Bowerman and Hastilow about measurements and whether the acrylic should be made to fit the electrical components, or vice versa. Hastilow missed some important meetings through

illness, and Daniel Hilldrup a freelancer contractor employed to do the complex CAD work had his busy schedule disrupted. We now began a discussion about what sort of diffusion material could be used to aid the internal refraction of the cubes' LED's, but there was an issue around the negative impact this would have on the ability of the cubes' infrared (IF) LED communication system. By March 2011 meetings Between Hastilow and Hildrupp at Metropolitan Works were beginning to bear fruit, and the shape and dimensions of the cube casings were beginning to materialise. Meanwhile meetings were also taking place between Hastilow, myself and IP21, the patent agents, at their London City offices. Hastilow had taken a leave of absence from work due to illness over the Easter period that year and his personal life and financial situation were becoming increasingly perilous.

An email Hastilow sent me in April expressed his concerns over ownership of the patent for *Cubed*. He was unhappy that the university might be claiming this in its' entirety. On the production front however, he had been making good progress with his electronics development and the new version was now able to receive communication on all six faces, make use of an accelerometer to determine orientation, and battery life had been extended. These were major technical break-throughs. Hastilow was aware that getting the PCB made for an actual set of cubes was key to any further development. It was now important to determine their precise functionality. We needed to answer questions such as where would a power switch be positioned, and how would games be selected. Hidrupp needed these decisions to be made and was awaiting a PCB to design the cubes acrylic housings around. By the end of May Hastilow had completed the PCB design, and these were now almost ready to be sent off for printing. He had also drawn up a list of components for them and these were now ready for me to order.

By the end of June Hastilow was struggling with the complexity of the project and in an email to me stated he was finding it almost overwhelming. He also said that he was unhappy about not getting paid for his work. Whilst previously, with the Folly PPP funding I had been able to allocate an actual payment to him, now those funds were being absorbed by London Metropolitan University and budgeted against his contracted hours. I knew his financial situation was insecure, and that working on a 0.4 contract did not provide him with much of an income. He was working harder than ever on the project, but without immediate financial reward. The meetings with the patent agents were ongoing at this time, and they were busy drafting a patent for an interactive device. Because we had presented *Cubed* widely in the UK and in Europe this application was going to be made in the USA. Upon reflection, I believe the only thing that was keeping Hastilow onboard with the project at this time was the prospect of the possibility of a share in future income that a successful patent application might permit.

The academic year was by now coming to an end, which would inevitably lead to a downturn in productivity, the PCB's were finally printed, but not until August. I had endeavoured to keep Hastilow involved in the project that year by chivvying him along as much as practicable. In May I had written up an academic paper on the project to be submitted by us in partnership to Siggraph Asia 2011, that was to be held in Hong Kong that December, and in July had used some of our HEIF funds to book tickets, flights, and accommodation for Ars Electronica, the International Electronic Arts festival taking place that November in Austria. Both these developments seemed to spur him on. My proposal for the new course in Tangible Media / Physical Computing had however by this time been rejected by the School of Computing. I had lost a mayor means of securing his future at our

university. To cap that at the end of the month Hastilow contacted me via email with some very bad personal news. He was struggling with mental ill health and was spending time away from London.

Just as Hastilows' health declined other negative impacts were beginning to be felt more widely on the social, economic, and academic climate of the time. The global financial crisis of 2007-08 had far-reaching and hard-hitting implications. Between 2009/10 and 2011/12 the annual government funding that ACE received decreased by over £84m, representing a loss of 17% of its total grant (Dempsey 2016). As a result of these cuts ACE announced that 206 of its regularly funded organisations (RFO's) would have their funding completely cut (Higgins, 2011). One such organisation was Folly, and in August 2011 Taylor Nutall announced that as a result of this loss they were to close, ending more than twenty years of supporting experimental arts practice (BBC, 2011). The government of the time had also changed the way higher education was funded, putting a greater onus on individual students. This meant a potential trebling of their tuition fees, while less funds would be allocated centrally to HEI's (BBC, 2010). As a direct result of this new funding regime, in May 2011, the Vice Chancellor of London Metropolitan University, Malcolm Gillies announce a round of cuts to courses, and of staff redundancies, in a bid to save money (Swain, 2011). University departments began the process of consulting staff over these losses. Both Hastilow and myself were included in consultations with our Heads of School, we were now working under the threat of redundancy. Metropolitan works was not immune to these cuts, and in October Matthew Lewis announced he was leaving the university. Marcus Bowerman was to take over as manager, albeit of a much-reduced staff, and with an enormous increase upon his personal workload.

Whilst an application for a US Patent for interactive device was submitted in March 2012[3] over the course of the 2011-12 academic year work on *Cubed* slowly diminished. In August 2011 Hastilow resigned from London Metropolitan University, although he continued his interest in the project. In an email to me he cited the poor state of his finances and emotional ill health as contributing factors to his decision to leave both work and London. By the end of November that year Metropolitan Works had finally cut the acrylic for the first two cubes of the new set. Bowerman however was struggling with increasing pressures of workload and limited staff support due to the restructuring of Metropolitan Works. This had the effect that progress with the new housings at this point came to a complete halt. Whilst Hastilow continued to work on, on an ad hoc basis working on the *Cubed* programming, I was unable to find someone with the necessary skills to work on its' assembly. I did eventually manage to arrange for Peter Petit, an electronics technician working in the School of Computing to carry out this work, but he was then made redundant. The project was petering out, and by this stage I had lost my motivation to keep things going. The network had collapsed, and in Hastilow I had lost my key resource.

The US Patent application for interactive device proved ultimately to be unsuccessful, this was on the grounds of *Cubed* lacking the necessary technical innovation. I find it difficult to argue with this assertion. To my mind if the project was at all innovative it was on a conceptual plane rather than a technical one. Whilst version one of *Cubed* had been developed and delivered in a short amount of time and on a tiny budget, version two ultimately failed, it's level of complexity proving

[3] Pub. No. WO/2013/014402. International Application No. PCT/GB2011/051396
Permalink: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2013014402

too great. The network I constructed was too big, and too dispersed, and I was unable to successfully manage the production processes it was ranged to deliver. I had not been able to successfully motivate these other newer actors, or to get enough of them to accept the projects principles. There was also not enough institutional support offered to Hastilow. I was unsuccessful in my bid to influence curriculum development within my school, a strategy I had hoped would provide a mechanism through which to enhance his teaching contract, and stabilise his finances. I saw *Cubed* as providing me with an opportunity to develop a research career. Folly were interested in supporting innovation in interactive arts projects and there was a definite overlap in our visions. I believe Hastilow's primary concern was financial, and given the limited nature of his 0.4 university teaching contract, I perfectly understand this position. Inasmuch as I was able to pay him a fee for the work he did for Folly, he was satisfied, and I judge this phase of the project to be highly successful. Once the project was funded by HEIF the situation changed and there was a subtle shift in what it needed to achieve, and to be deemed to have delivered a favourable outcome. The onus was now on turning a profit: filing patents, and exploiting intellectual property. In this respect the university and Hastilow were in accord, but unfortunately this consensus existed only fleetingly. The terms of the funding meant I was unable to pay Hastilow any fee above or beyond his university salary and I feel that the lack of institutional investment in this valuable member of staff ultimately contributed to his resignation.

At the beginning of this chapter I describe *Cubed* as an art & technology project. What a delicately scripted and oh so simple logogram the ampersand is, but what a lot of work I was asking it to do in this conjunction, in aligning two words, the two worlds that I have sought to assemble in its making. In examining the two

agencies that funded the project, it is probably more appropriate to describe *Cubed* as consisting of two distinct phases. In phase one it was an arts project, and in the translation in underwent in phase two it became a technology project. What I sought to achieve in the making of this project was nothing short of the aggregation of these two disciplines. This was a very ambitious undertaking, *Cubed* asked a lot of particular individuals, and made demands on an infrastructure that was at the time going through a major restructuring that meant it was not robust enough to nurture the project.