Interrogating Interactive Interfaces:
On balance
in the evocation of environmental responsibility
in the creation of Responsive Environments

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Chapter 1 - Introduction

1.1 Set & Setting: The Scene of Environmental Responsivity

You walk into a dark room: the sanctified zone of the art gallery/museum/performance space.

You see only outlines of people like yourself, exploring the space with a mixture of curiosity and caution.

You go about your own journey, as there are no intervening intermediaries.

You are enveloped in random pandemonium of polyphonic waves of amplified sounds traveling all around the space.

You are immersed in a maelstrom of abstract images projected onto all manner of surfaces.

You are surrounded by an arsenal of technical apparati, with all their uncomfortable connotations of the military-industrial machinery of the night.

You seem to be a cog in a gigantic breathing living machine, with an architecture whose malleable proportions wax and wane.

You search for some reassurance - some contraption/gizmo/hot spot/cursor/button-to-click - but must resign yourself to the invisibility of the interface.
You realise the burden of being unencumbered, as it is you yourself, interfacing with the environment, that forms the interface. It dawns on you that the consequences of your actions and inactions are amplified in a collective contribution to the environment.

You don’t like being treated as part of a collective homogenous entity. You motion a gesture with your hand and instantly trigger a noise that corresponds with and tracks your hand’s movement, as if you are conducting an invisible orchestra.

You breathe a sigh of relief as you surmise that the seeming chaos of the environment is a projection of the random actions of the participants.

You repeat the same gesture, but with intentionality as you probe whether causality is determinate. This time the sound you trigger is different, perhaps due to the miniscule contrast between a randomly exploratory gesture and its deliberate repetition, or perhaps the computer system is engaging you in a conversation, whereby each action is a culmination of previous responses.

You’ve been to theatrical plays, you’ve watched sports players compete, you’ve played computer games and now you’re not sure who is playing whom: in the complex web of interrelationships, are you a player or are you being played, as a tool or a fool?

Your friends you came with are lost to you, as you cannot make out form in the frenetic multiplicity of strangers.

You’ve been offered power and control but your trigger happiness dissolves into responsibility to collectively engage with the environment in cooperation with a room full of strangers, as it is only through interactions with its inhabitants that the environment springs to life. To passively and safely sit and watch from the back is no option. The only people sitting in the building are probably the overseers with eyes fixed on computer monitors, scanning through reams of linguistic and logico-mathematical rules. They alone seem to be above this panopticon law. When everyone is under surveillance, entry equals consent and all are equal: sensors judge gestures, contact with walls and floors, eye movements, breathing rates and the like with the indiscriminacy of machines. The environment appears charged with power: the power of electricity linking machines and bodies via electrostatic charges and the power of a democratic free-for-all of collective reciprocity.
In this Responsive Environment, an amplifying cycle is formed between your external bodily projections and their re-internalisation through cybernetic feedback loops. Any sense of stability with the environment is replaced by a sense that the ecosystem perpetually oscillates between anarchy and autocracy. As your heart beat returns to normal, you experience communion amidst the myriad interconnections between animate and inanimate entities. In this more focused state you hear an amplified heartbeat embedded in the surrounding sound that is so in sync with yours that you realise something as interior as your heartbeat is being projected into the world outside your body. With such a direct feedback loop, your response to the environment alters: your breathing rate and carbon dioxide emissions feedback into the system. The environment responds in kind. Equilibrium gives way to entropy as if in response to the inability of humans to co-operate without hierarchy and the imposition of order.

You realise why you were instructed to enter with bare feet as, looking down, you see computer generated Artificial-Life organisms, evolving according to kinetic energy transfer from naked human feet.

However there are no officiating intermediaries, only complexity deities, and in the agora, spontaneous factions form as people inform one another. A stranger approaches, offering advice gleaned from repeated exposure to this environment. Ordinarily you won’t socialise with a stranger, as your cultural conditioning has you ignoring the ubiquitous Other when present before inert art. However here your bewilderment welcomes a kindness with its promise of transmitting intergenerational information.

The stranger talks of a narrative structure without beginning, middle or end. Instead of linearity, indeterminate immersion through the rooms offers a non-linear journey of spatialised understanding. The stranger explains away the complex causal relationships between trigger mechanisms and sequencing of the audiovisual media. Cause and consequence relate via combinations of previous generations’ actions with your own, such that the tabula rasa is an evolving culmination of all events and effects. Little wonder that nothing directly yields to your command: you’re picking up a conversation between parties you have never heard that began a week before you entered a scene that has no script.
You hope that you’ve inherited an environment that hasn’t been soiled by those that have gone before as you reflect on the bind of passing on the space with some semblance of stability for those to come.

Your impromptu dialogue is stopped as spontaneously as it began as you become aware that a hidden microphone adds your conversation to a generative database of audience feedback.

Your conversation becomes fragmentary phrases played back using an Artificial Intelligence linguistic process that intermittently answers with emergent, unpredictable responses.

You’ve seen enough to know you’ve seen enough, and out of desire for conclusion, you go in search of the exit. As you leave the space you intercept an infrared beam that causes a crystal vase to drop from a shelf, irreparably smashing onto the ground nearby. So much for virtual responsibility in a virtual environment. At least in the wider world anonymity and indifference prevail. However, the street outside appears changed: you sense interconnections between the concrete encased tree surrounded by parked cars in the park. Strangers outside seem strangely familiar. The connection clicks like yet another mouse-click: audiovisual representations of those milling around the space are processed into the installation, implicating those that may still be unaware. As you move further away from such an electrically and politically charged space, you are surprised that you still feel a heightened sense of connection to the environment. You attribute this to a strategically placed car park sign stating that surveillance cameras transmit the random indeterminacy of cars leaving and arriving, levels of emission and so forth, as another stream of data fed into the installation.

You look down the street, seeing radiating levels of diminishing significance in the suburban surrounds. Wanting closure, you look at the installation booklet. There, in print at the end is evidence of further domains of implicit complicity: navigation through the installation’s website is altering the interior architecture of a neighbouring room. Over the narrative of the installation, participants over the internet are collectively authoring irreparably destroying a kinetic sculpture composed of hacked walls. As you drive off you try so hard but you don’t understand just what you will say when you get home...
1.2 The Pivotal Problem and Research Question

This bricolage just described draws on pivotal artworks by others and myself, which are the subject of this thesis. These artworks take the forms of architecture, robotics, biorobotics, kinetic sculptures, electro-acoustic music/sound, aural and visual literature (as speech and computer generated text), visual media (as animation, photomedia, motion-paintings and video), and innumerable recombinant hybrids between these artforms.

From these forms and mediums, this thesis explores a constellation of practices known as Responsive Environments. Myron Krueger coined the terms Responsive Environment and Interactive Art in 1969 at the University of Madison, Wisconsin. His practice as an artist, computer scientist and academic posited Responsive Environments as immersive, interactive, electronic artworks whose technological responsivity was of fundamental importance. A central concern in this endeavor, of evoking responsibility through such responsivity, is readily apparent in Environments, an earlier artform that Krueger argues was fundamental in the formation of Responsive Environments.

The notion of artworks as Environments was introduced and pioneered by Allan Kaprow, beginning with the first staging of his Environment Words, at the Smolin Gallery in New York City in 1962. In the catalogue for this exhibition, Kaprow stated that Words “is an ‘environment,’ the name given to an art that one enters, submits to, and is -in turn- influenced by.” Environments denote immersive, participatory and multi-sensory ‘total works of art’ in the manner of gesamtkunstwerk. In the case of Words this involved

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1 Such artforms are commonly presented in installations termed Virtual Environment, Virtual Reality, Mixed Reality or Augmented Reality. These practices are referred to with capital letters to denote an artistic or scientific practice. As an example, virtual reality may refer to such contexts as philosophies of ‘reality’ and ‘virtuality’ while Virtual Reality refers only to an artist and/or scientific construction of a mediated environment where humans engage with computer generated sound and vision.


two neighbouring rooms filled with strips of words written on the ceiling and walls and with variable lighting and modifiable record players and loudspeakers. Audience participation with the content and form was central to this Environment, as attendees were invited to “turn on the phonographs; roll the rollers; [and] add your own words.”

The pivotal problem explored in this thesis may be seen in an excerpt from Kaprow’s statement for the first exhibition of *Words*:

> Of course, being active, we can misuse any environment, natural or artistic. We can destroy a landscape through carelessness, and here we can refuse to consider what responses are appropriate to the nature of the idea. For instance, it is inappropriate to staple word-strips askew, onto the floor or anywhere in the smaller room; and it would be just as unfit to write with the coloured chalks in the larger room. There are freedoms for the visitor (as there are for the artist), but they are revealed only within the limits dictated by the artwork’s immediate as well as underlying themes.

In this thesis, what Kaprow referred to as “freedoms” for attendees and artists are considered ‘environmental responsibilities’: for how artists as the “instigator” create the Environment for how “participants” may write, re-write, move and remove the content (in this instance words on cardboard, paper and chalk) and influence the overall dynamic of the physical environment (in this instance modify the lighting, record players and loudspeakers). In such situations participants negotiate a hybrid responsibility: to the social environment, being fellow attendees within the *gesamtkunstwerk*, and to the physical environment, being their interventions with the material content of the space. Collectively, environmental responsibility was evoked by

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9 Kaprow in Reiss 1999:14.

Kuzmanovic’s favoured terminology is ‘participants’ as it encompasses states of being a passive audience and active interactants, given the range of statuses participants may traverse in any one encounter. In this thesis, the term ‘attendee’ is also used, as it denotes the extensive range from passive to interactive behaviour of anyone attending an interactive work.
participants explicitly engaging with the content of the Environment to influence both contemporaneous co-participants and future participants. Kaprow argues that attendees and artists responsibilities were “revealed…by the artwork’s immediate as well as underlying themes”: he ceded significant responsibility to participants (via incorporating their unpredictable influences in the form and content of Words) within a structure of limitations whereby his authority as author was maintained (via the instructions for different participation in the different rooms). In so doing, Words explored the permeable membrane between immediate material responsibility and implicit or “underlying” social responsibility in participant-participant interaction. Kaprow highlighted one of these “underlying themes”: combining these two intertwined modes of responsibility evoked environmental responsibility, as Words questioned whether people “misuse any environment, natural or artistic.”

These themes are amplified in the electronic form of Responsive Environments, whose technological basis adds a significant dimension to how they represent the “misuse [of] any environment, natural or artistic.” In Responsive Environments, artist and audience responsibility grows in complexity with the complexity of the artwork. Through the computationally generated behaviour of Responsive Environments, audience responsibility is no longer to inert words on cardboard strips, but with interactive entities that may unpredictably respond to participants, such as the description in the opening bricolage of using Artificial Intelligence to formulate semi-autonomous responses to participants’ speech. However, evoking participants’ responsibility via technologically mediated responsivity, as described in the opening bricolage, creates myriad challenges for engaging participants in a Responsive Environment, whose engagement is a precondition for being able to be responsive to the artwork and thus be responsible.

The central research question of this thesis is thus: how may Responsive Environments be created to evoke environmental responsibility in the interaction between artist, artwork and audience? On balance, such evocation is determined by combining three principal ingredients -content, form and Interaction Design- in a recipe appropriate for the subject and context of each artwork:
1) Content

Content and subject matter signify what a Responsive Environment is about. Artworks expressly about the subject of responsibility may evoke responsibility to the physical environment of the artwork using relatively simple interactivity. One such means is combining environmentalist subject matter with interactivity that encourages awareness of the influences of participants' behaviour on the artwork. This approach prioritises narrativity over interactivity, to communicate the content in a relatively ‘intact’ fashion. Such levels of interactivity allow the content to retain narrative cogency, which may implicate attendees in the subject matter through relatively easier engagement with the narrative. Consequently, the responsivity of such artworks is relatively simplistic, wherein attendees' responsibility may be relatively indirect, implicit and symbolic.

My artwork *Kali Yuga* presents an evocation of environmental responsibility through prioritising engagement with the content in a correspondingly “reactive environment.”

2) Form

Form, structure and functionality extensively influence one another in Responsive Environments. They denote the linearity, sequencing, malleability, modularity and granularity of the content that forms the artwork. Prioritising form over content may facilitate greater complexity and more interactivity, through which participants may exert more nuanced and multifaceted consequences. Consequently, the interactivity of such artworks may be relatively complex, such that attendees’ responsibility may be relatively direct, explicit and literal.

My artwork *StilmS* presents an evocation of environmental responsibility through prioritising form, structure and functionality to offer literal and direct environmental responsibility.

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*Kali Yuga* is the subject of Chapter 4.3 on p184.
13 *StilmS* are the subject of Chapter 5 on p214.
3) Interaction Design

Interaction Design -and the sub-field of Interface Design\(^{14}\) which forms part of the overall design of interactivity- decisively influence how participants may engage with the artwork (and one another in works for multiple simultaneous co-participants). Whether content is expressly about responsibility, whether form is simple or complex, Interaction Design is pivotal to evoking responsibility through audience engagement. In works for multiple simultaneous participants, one such means for how Interaction Design may evoke responsibility is through guiding co-participants as to what influences on the artwork individuals may and may not be responsible for.

My collaborative artwork *Emergence* presents an evocation of environmental responsibility through prioritising Interaction Design to explore multifarious environmental responsibility for multitudinous participants.\(^{15}\)

As the combination of content, form and Interaction Design determine the manner of responsivity, so too do they determine the associated mode of responsibility. This arises since responsivity and responsibility reinforce and are indexically tied to one another in a Responsive Environment. Responsivity and responsibility share a common etymology and make meaning relative to one another, given "the ethical conception of responsibility as responsiveness to the other."\(^{16}\) The Oxford English Dictionary defines "responsivity" with two words. It is defined as that which is “answerable,”\(^{17}\) as well as that which is "responsible,"\(^{18}\) which etymologically belongs to “responsibility” as “a moral

\(^{14}\) In this thesis, Interaction Design is used to refer to the design of interactivity as well as Interface Design as Interaction Design includes the design of material interfaces and immaterial processes of interfacing. The interrelationship between Interaction Design and Interface Design is discussed on p72.

\(^{15}\) Emergence is the subject of Chapter 6 on p243.


obligation to behave correctly towards or in respect of a person or thing.”

For David Rokeby, widely considered the most influential and innovative interactive artist, “accepting responsibility is at the heart of interactivity” as he defines responsibility as being “literally, the ability to respond.” It is this dimension of responsibility that this thesis is concerned with, due to what Terry Smith calls “the interaction between responsiveness (the motor dimension of interactivity) and responsibility (its moral/social dimension).”

This thesis explores the evocation of responsibility as distinct from ‘ethics,’ in line with the artists who are the subject of this dissertation, as they overwhelmingly favour the term ‘responsibility.’ In the above definition of responsibility used in this dissertation, that of “a moral obligation to behave correctly towards or in respect of a person or thing,” what may constitute correct behaviour arises from the specific context and content of each artwork. This encompasses the potentially amoral nature of responsivity as this thesis includes art that evokes ambiguous and uncertain responsibility, rather than the targeted use of art to induce ‘ethical’ behaviour. Behaving responsibly in response to the interactivity required to engage with an artwork may include behaviour considered irresponsible according to bylaws or societal conventions. This conundrum is outlined below in Section 1.5.1, where I recount my experience of being invited to give an electric shock to the performer of an interactive artwork. This thesis aligns with Rokeby’s argument that interacting in a Responsive Environment offers “a representation of responsibility” wherein “each participant in an interaction receives the sensation of responsibility; each has the ability to respond.”

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21 Terry Smith. E-mail message to author, November 17 2005.


creating Responsive Environments to *evoke* a “sensation” or “representation of responsibility,” as evocation is defined as bringing an experience to “the conscious mind” and to “elicit (a response)” rather than to catalyse, advocate or induce ‘ethical’ behaviour.

The diverse implications arising from coupling ‘environmental’ with ‘responsibility’ require an outline of the dominant modes of responsibility and responsivity in Responsive Environments. Artwork-specific responsivity and responsibility are discussed over the course of this dissertation, as they arise from the particular content and context of each artwork. In summary they are:

1) In artworks for one-on-one interaction (being one attendee at a time engaging with the work with no one else present), responsibility is negotiated between the artist, artwork and the participant interacting with the artwork. The participant’s responsibility is to the physical environment of the artwork in the real-time of their engagement. Artists’ responsibility is in retaining authorial responsibility while creating sufficient scope for interaction to evoke responsibility in the participant’s engagement with the artwork.

2) In artworks with one-on-many interactivity (being one participant at a time with other non-interacting attendees present), environmental responsibility takes on an additional dimension. The participant interacting with the artwork also acquires responsibility to the social environment regarding how their influence on the real-time behaviour of the artwork influences non-interacting attendees. Non-interacting attendees negotiate individual and collective social responsibility to the interacting participant regarding how they influence the participant’s interaction with the artwork.25

3) In artworks for one-on-one interaction where the artwork evolves, adapts or responds based on cumulative participant interaction,

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25 As discussed in this thesis, many artworks for one-on-one interaction are engaged with in one-on-many interactivity, despite the artist’s intension for the work to only be engaged with in one-on-one interaction. The dominant effect is undesirable impatience toward the interacting participant who may be burdened by their performative participation.
environmental responsibility takes on additional dimensions to that outlined in 1). The participant’s responsibility is to the physical environment of the artwork in the real-time of their engagement and in the ensuing influences produced on future states of the artwork. Artists’ responsibility is extended in communicating to participants what the ensuing consequences of their interaction may be while their responsibility to the artwork is lessened according to how autonomous the behaviour of the artwork becomes as it evolves or adapts.

4) In artworks with one-on-many interactivity where the artwork evolves, adapts or responds based on cumulative participant interaction, environmental responsibility for artists and attendees comprises all the dimensions listed in 2) and 3).

5) In artworks for many-to-many interactivity (being interaction with multiple simultaneous participants), participants’ responsibility to the social environment is negotiated between contemporaneous co-participants in the real-time of their engagement. Participants’ responsibility to the physical environment of the artwork is between each co-participant and the real-time behaviour of the artwork. The negotiation between individual and collective responsibility arises from their intertwined responsibilities to both social and physical environments of the artwork.

6) In artworks for many-to-many interactivity where the artwork evolves, adapts or responds based on cumulative participant interaction, environmental responsibility for artists and attendees comprises all the dimensions listed in 2), 3), 4) and 5). Evoking participants' responsibility to the physical environment of the artwork creates additional challenges, such as communicating which participant influences what in real-time and which real-time influences from which participant led to which ensuing influences. In this context environmental stewardship more accurately describes participants' responsibility due to the figurative custodial role they play in the synthesised or simulated evolution of the artwork.

In these six modes the ‘environment’ referred to in the coupling ‘environmental responsibility’ is the social and physical environment of the
artwork. In Responsive Environments these two interconnected domains impinge upon one another: the social environment encompasses cybernetic cycles of Human-Human interactions (artist-attendee and attendee-attendee), while the physical environment encompasses Human-Environment interactions (artist and attendee with the physical environment of the artwork). The physical environment includes the interface through which artist and attendee interact: namely Human-Machine interaction, whereby attendees interact with the artwork.26

All the above categories and domains may seek to evoke additional dimensions of environmental responsibility: to exterior environments of non-human ecosystems and/or the quotidian and ubiquitous ‘real world.’ While the physical environment technically encompasses the natural environment, in this thesis ‘physical environment’ refers only to urban or built environments and ‘natural environment’ refers only to non-human ecosystems. ‘Quotidian environment’ refers to the combined social and physical environment outside the artwork. As such, Inside27 refers to the social and/or physical environment of the artwork, while Outside refers to the natural and/or quotidian environment of the wider-world.

Blurring boundaries between Inside and Outside is instrumental in evoking environmental responsibility in Responsive Environments. This occurs through the Inside environment representing a proxy for an Outside environment. Key practitioners, such as Simon Penny, argue that interaction between participants in a Responsive Environment fosters “Synthetic Sociality”28 of harmoniously acrimonious Outside environments. For Penny, the “aesthetically manipulated quality” in such artforms is “behaviour” of the

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27 ‘Inside’ and ‘Outside’ are capitalised to denote symbolic intent.


The use of my complementary notion of Coerced Cooperation to express my responsibilities for evoking Inside-Outside relationships in Emergence is discussed on p260.
artwork and participants’ interaction with the artwork. With artists’ responsibility focused on designing the “aesthetic of behaviour” he argues that “the model for this behaviour must necessarily be human behaviour, the way in which humans interact with each other, or with other living things.” As an engineered microcosm of quotidian environments, responsibility on the Inside may symbolically represent responsibility to the Outside. Evoking this Inside-Outside relationship stems from the influence of Environments on Responsive Environments. Kaprow expanded upon this Inside-Outside relationship in ‘The Shape of the Art Environment’ in his Essays on the Blurring of Art and Life which articulates the central concern in his Words. In such a constructed context participants’ responsibility determined their collective and cumulative “misuse” or use of the “natural or artistic” environments. This Environment evoked implicit responsibility to the natural environment by evoking explicit responsibility to the social and physical environment of the artwork.

A permeable membrane between Inside and Outside is further explored when evoking Outside natural environments in Responsive Environments. Boundaries between the synthetic “engineered environment” and the natural environment are explored in Responsive Environments that systematically model or optically depict natural environments. In this approach, responsibility to the physical environment of the artwork symbolically represents responsibility to the natural environment. Optical depictions may evoke responsibility to this surrogate natural environment through representationalist content, such as audiovisual depictions of nature. This refers to prioritising content and narrativity in the above description of the three ingredients, whereby subject matter, such as environmental issues,

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31 Kaprow in Reiss 1999:14.

may be more cogently presented. Alternatively, systematic modeling may offer a greater degree of interactivity with abstract, complex and dynamic processes, such as evolution and adaptation. Through biomimesis, environmental responsibility may be evoked through such artworks’ more nuanced and involved interactivity afforded by their high degree of responsivity. This refers to the prioritisation of form in the above description of the three ingredients.

In turning from the abstract to the concrete, it is necessary to specify what participant ‘responsibility’ entails across such divergent artforms with such variance within and between artworks. Amidst all the above variables the constant remains: responsibility is defined by the content and context of each artwork. In particular, participant responsibility manifests through the means through which they interface, namely haptic, tactile, kinaesthetic and proprioceptive (including exteroceptive and interoceptive) processes.\(^1\) If a Responsive Environment responds to participants’ voluntary actions, such as their movement through the space, then their responsibility to the physical environment is through their external bodily processes. If a Responsive Environment responds to participants’ semi-voluntary actions, such as their breathing rate, then they may exercise intermittent responsibility to the physical environment through their internal bodily processes, as ones breathing rate may periodically be voluntary (by holding ones breath) but then becomes involuntary again when needing to take another breath. If a Responsive Environment responds to participants’ involuntary actions, such as their heart rate, then they can have no responsibility to the physical environment through internal bodily processes they have no conscious control over.

On balance, the pivotal determinant for evoking environmental responsibility is the litero-metaphorical balancing act between four binaries that are inherent to Responsive Environments: authority-control, determinacy-indeterminacy, simplicity-complexity and narrativity-interactivity. This

\(^1\) Techniques include spatial navigation (such as infrared sensors, sonar sensors, 3D body motion tracking devices) and biofeedback (such as thermal heat imaging, heart and breathing rates, sweat and stress levels, eye motion sensors). The use of these techniques is discussed in *The Art and Science of Interface and Interaction Design*. Edited by Christa Sommerer, Lakhmi Jain and Laurent Mignonneau. Berlin: Springer. 2008.
balancing act is crucial for evoking environmental responsibility as a ‘balanced’ artwork offers potential conditions wherein artists maintain sufficient authorial responsibility while offering participants sufficient responsibility in their interaction with the artwork. The pursuit of balance informs the relationship between all the elements in an artwork and the negotiation between competing and contending considerations. Negotiating contested zones of responsibility between artist and attendee hinges on where the artwork is situated between artists’ authority versus the control they offer participants; where the artworks’ causality sits between determinacy and indeterminacy; where its behaviour sits between simplicity and complexity and how the artwork negotiates the trade-off between narrativity and interactivity.

Collectively, these four binaries create the relationship between the artworks’ degree of responsivity and the according degree of responsibility maintained by artists and thus required by participants. As an example, a Responsive Environment can either posses a high degree of narrativity or a high degree of interactivity, while negotiating the effect of this narrativity-interactivity trade-off on the trade-offs within the other three binaries. Highly interactive and highly complex artworks occasion equivalent responsivity, which requires a high degree of responsibility for participants as they exercise such control and influence over the artwork. However this combination may problematically evoke environmental responsibility as it may prove onerous for participant engagement with the artwork. Conversely, minimally interactive artworks with deterministic causality posses low level responsivity, meaning that participants exercise relatively insignificant responsibility to the artwork. However this combination may problematically evoke environmental responsibility as participants may not be compelled to engage when offered such a level of control and influence over the artwork.

The main challenge in creating Responsive Environments is combining the three ingredients subject to the four binaries to form recipes which maintain artists’ authorial responsibility while evoking attendees’ environmental responsibility. How this dissertation and my artworks probe this problem is discussed in the following two sections.
1.3 Exploring the Research Question through the Dissertation

This project has not developed new technologies or explored the effects new technology has on society and has not proven nor shown theoretical and technological possibilities. The research has focused on the challenges that develop from applying interactive video installations to the creation of evocative experiences.

Robin Petterd

The central research question - how to create Responsive Environments to evoke environmental responsibility in the interaction between artist, artwork and audience - is probed by considering its constituent parts: How may A (creating Responsive Environments) be attempted so that B (Artist-Artwork-Audience interaction) may occur according to criteria C (the Responsive Environment evokes audience responsibility). In this formulation of the question, the problem lies in C (negotiating between binaries inherent to Responsive Environments); the context the problem is explored in is B (Artist-Artwork-Audience interaction) and attempted solutions to evoking responsibility are found in A (examples from my own and others' art practices).

The dissertation documents the search for solutions in the writings and artworks of relevant artists. Like Petterd's above mentioned PBR PhD, this thesis also "developed methodologies for evoking sensations using interactive video installation art."35 However the argument developed in my dissertation takes issue with Petterd's contention that "the challenge with applying interactivity to create environments that aim to evoke sensual responses is the need for conscious interaction and any interface to be intuitive."36 I argue against universalising methodologies of creation, in favour of context- and content-appropriate approaches that encompass intuitive and counter-intuitive interactivity. My discussion of such approaches is grounded in the artworks considered.

Context- and content-appropriate approaches denote issues particular to respective artforms, as it is only viable to explore select facets of Responsive Environments in this thesis, given the extensive terrain over which they spread. My concern is explicit and implicit environmental responsibility rather than efficacy of a Responsive Environment to instill environmental responsibility. Rather than ‘test’ if artworks ‘successfully’ evoke environmental responsibility, I am concerned with potential evocation through combining content, form and Interaction Design in creating rather than receiving art. Keith Armstrong’s PBR PhD similarly found evaluating audiences’ reception of his artworks was beyond a viable scope, as it would have required collaboration with a social scientist concentrating on audiences. Affirming Armstrong’s insistence of involving a social scientist for understanding audiences’ experiences, the art collective FoAM have collaborated with anthropologist Magdalena Wesolkowska for such endeavours.

While Beryl Graham’s PBR PhD examined “the particular problems” for Interactive Art in “conventional art gallery or museum spaces,” this thesis examines the problems particular to interactive installations in conventional (art galleries and museums), semi-conventional (theatrical and performative spaces) and unconventional spaces (public indoor and outdoor areas, illegal/’illegitimate’ spaces and Artist Run Initiatives). Most fields of ‘Interactive’ Art are excluded, as only cited artworks are relevant. For example, only online interactivity related to ‘real-space’ interactivity is addressed, as, like Rokeby, my concerns are human scale experiences in human scale physical environments:

37 I was able to research audiences’ reception of Emergence as that project had suitable conditions for so doing (see p287).
physical presence and involvement, scale and sense of space, and real-timeness are factors that are often important in my work and hard to implement on the web.\textsuperscript{40}

The main source of information is writings by practitioner-theorists, as these provide insight into their embodied knowledge from writing about their practice.\textsuperscript{41} Comparing catalogue essays and artist statements provided at their stagings with their academic writing reveals aspects that may not be explicitly articulated in the actual artworks, such as their rationale for their form, content and Interaction Design. Such comparison is integral for understanding artists’ attempts to evoke responsibility in their work as their practice may explore ambiguous responsibility, while their scholarly writing may articulate their rationale for evoking such modes of responsibility.

As a case in point, Ken Feingold’s \textit{The Surprising Spiral} (1991), one of the first canonical Interactive Artworks, utilises trammeled interactivity, which is antithetical to the intuitive interactivity Petterd advocates. In \textit{Against Friendly Interfaces: Aesthetics of Trammeled Interaction}, Maciej Ozog defines trammeled interactivity as “bewildering, changeable and unpredictable forms of the artefact and/or creating unconventional forms of the interface that hinder the interaction with the artefact.”\textsuperscript{42} Feingold’s scholarly writing details his rationale for such interactivity, wherein the “complex cause and effect structure” involved non-predictable variations between instantaneous, delayed and cumulative consequences from participants’ interactions with \textit{The Surprising Spiral}. He designed the work for participants to be ambiguously responsible for future participants’ experiences whereby “the actions of previous viewers will also affect the structure found by another viewer.”\textsuperscript{43} Feingold’s rationale was that he “wanted these [types of consequences] to


\textsuperscript{41} Such text is produced on a laptop, the same device used for the vast majority of the art produced for this PhD. It is meaningfully distinct to compare a composer or filmmaker writing about their practice, given that the mediums they practice in are different from the mode used to produce their writing.


mirror our daily cause and effect experiences" which he argues are similarly complex and ambiguous. As public information at the stagings of this artwork did not mention these topics, Feingold found that “many who encountered this work were frustrated” while Erkki Huhtamo observed that “users have frequently felt puzzled.” Nevertheless Ozog, like Feingold, maintains that trammelled interactivity may viably evoke responsibility, provided “the construction of the artefact and the interface should disclose the interactor’s role in the process of interaction and emphasize his/her responsibility for its course.” This highlights the role of artists’ disclosure in their scholarly writing for emphasizing audiences’ responsibility, given the discrepancies between that which can be communicated solely by an artwork and writing designed to augment an artwork. Such discrepancies are widespread, given that ambiguity and indeterminacy are desired qualities in the cited artworks. A similar gulf exists between the information I provided at stagings of my artworks and this dissertation.

In this vein I have omitted contemporary non-academic artists from this discussion, such as Rafael Lozano-Hemmer, since they generally do not communicate about their practice beyond relatively trivial catalogues and artist statements provided at exhibitions. For related reasons, I have deliberately focused on artists’ own words, to minimise the obfuscating tendencies of ‘artworld’ rhetoric that clouds artists like Lozano-Hemmer. Even so, my discussion augments the self-reflexive writings of cited artists by drawing upon art history, media-art theory, and critical theory, as these

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44 Feingold 2002:123.
47 The influence of this on my strategies for my Kali Yuga and StilmS is discussed on p187 and p242.
48 Principally: Söke Dinkla, Allan Kaprow, Jack Burnham, Peter Weibel and Timothy Druckrey. Media archaeology is a related sub discipline.
49 Principally: Andrew Cameron, Erkki Huhtamo, Lev Manovich, Mitchell Whitelaw, Noah Wardrip-Fruin, Mark Meadows and Grahame Weinbren.
perspectives on interactivity, responsibility and artist-audience relations in Interactive Art illuminate facets of Responsive Environments. These perspectives are referenced in Chapter 2 to illuminate a review of this field of art practice. Chapter 3 presents five case studies which explore various strategies for using interactivity and responsivity over the career trajectories of three solo (Garth Paine, Jon McCormack and David Rokeby) and two Interactive Art collectives (Keith Armstrong/Transmute Collective and FoAM). The relevance of other artists such as Myron Krueger, Bill Seaman, Christa Sommerer, Laurent Mignonneau, Eduardo Kac, Karl Sims and Simon Penny are referenced in Chapter 2. Specific resonances with other artists, such as Luc Courchesne, Grahame Weinbren, Ken Feingold and collectives such as Time’s Up, Blast Theory, The Mixed Reality Lab and The Builders Association are referenced in the discussion of my PBR in Chapters 4, 5 and 6.

The dissertation concludes with conjectures about the direction practice appears to be taking, given that balance has always been and seems always to be elusive, in light of practices that anticipate imminent advances in Artificial-Life (Alife) science, Artificial Intelligence and Complexity Sciences. Speculation posits the possibility of balanced positions of the ineffable binaries inherent to Responsive Environments, with artworks operating somewhere along frail, fertile and porous boundaries at the edge of chaos. Conjectures about future directions concern a strive for ‘evolving’ artworks using ‘dialogical’ interactivity to evoke environmental responsibility in harmony with

56 These artworks are explored in Chapter 7: Conclusion.
myriad other mutually exclusive aspects of aesthetics, form, function, medium and subject matter.

1.4 Exploring the Research Question through the Creative Component

Ideas exist between ideal realms of “life-as-it-could-be”\(^{57}\) in Alife and real realms of “life-as-we-know-it”\(^{58}\) in Biological-Life (Blife).\(^{59}\) As a practitioner-theorist working between these realms, Jon McCormack aims “to investigate the possibilities of ‘art-as-it-could-be’”\(^{60}\) based on his Alife research into “the idea that life-as-it-could-be might create”\(^{61}\) these necessary conditions. Alife science is integral to this possibility, as it concerns “a philosophy that supposes life can be defined in general terms by its mechanisms, not in any particular materialisation.”\(^{62}\) However unlike The Beauty to Be - the subtitle of McCormack’s article from which this definition is taken - this thesis documents how ideas require a material substrate in order to ‘Be’, as becoming the Blife of art-as-it-actually-is pivots on what is possible in any artform, rather than what may become possible in emerging artforms.

My negotiation between the realms of real and ideal involved conceiving and executing a suite of artworks where interactivity and responsivity were but two (albeit major) elements in the totality of creation and production. Their iterative development demonstrates content and context-appropriate strategies to address the problems inherent in interactivity and responsivity when these are the major elements addressed in both creation and production.


\(^{59}\) Braeckman 1995:269. The apotheosis would be an application of Helmreich’s “life-as-it-should-be” to ‘art-as-it-should-be’ according to the discussion in the conclusion in Chapter 7.


\(^{61}\) McCormack 2004a:3.

\(^{62}\) McCormack 2004a:1.
The following outline of the suite touches on points that are extensively discussed in Chapters 4, 5 and 6, and in Appendixes C, D and E:

1) Inverted Preverted (2004-5), D#Generative (2004-7) and Sly Drooler (2004-5). Refer to Chapter 4.2 for photographic documentation of the making of and completed works in their site-specific installation.

2) Tat Avam Asi (Kali Yuga) v1 (2004) and v2 (2005-8) (hereafter KYv1 and KYv2 respectively). Refer to Appendix A for KYv1 and Chapter 4.3 for photographic documentation of a 2008 staging of KYv2.

3) StilmS v1-v3 (2004-5). Refer to Appendix A for video documentation of a 2004 staging and Chapter 5 for photographic documentation of four 2004 stagings of StilmS.

4) Emergence v1 (2004), v2 (2005) and v3 (2007). Refer to Appendix A for a documentary film about v2 and an entire v3 staging and to Chapter 6 and Appendix E for photographic documentation of v2 and v3.

The suite chronologically progresses from control over content creation and execution (in 1 and 2), to control over content with purposefully subjugated control over execution (in 3) and to collaborative co-creation amidst dialogical engagement with multiple simultaneous variables (in 4). In parallel, the works progress from Plastic Art (in 1), to non-linear single channel Media Art (in 2), to multi-channel semi-immersive performative-installation (in 3) and to full scale multi-channel immersive installation (in 4). Similarly, my authorial responsibility shifted from a high level of control over singularly created content (in 1) to focusing on creating context through Interaction Design in increasingly collaborative works (in 4).

63 The last stage in this progression was in professional practice: as an Interaction Designer on the making of the Museum of Australian Democracy at Old Canberra House. While this involved Interaction Design that was highly relevant to Emergence and in an international collaboration with dozens of co-creators in diverse domains, it is
The suite purposefully transcends boundaries between mediums and artforms, relative to four broad fields and periods of Interactive Art:

1) Combining ‘analogue interactivity’ with painting and sculpture relates (1) to “pre-electronic”\textsuperscript{64} precedents to Interactive Art, such as works by Jasper Johns, Max Ernst and Roy Ascott\textsuperscript{65}

2) Combining a dramaturgical cinematic narrative with trammeled interactivity relates (2) to early 1990s narrative based Interactive Art such as works by Courchesne and Weinbren\textsuperscript{66}

3) Combining audience interactivity with organicist audiovisual data-sets relates (3) to Seaman’s “recombinant poetics”\textsuperscript{67} and Feingold’s approaches to Responsive Environments\textsuperscript{68}

4) Combining instantaneous and cumulative influences as exerted by groups of participants relates (4) to contemporary synthesised evolution and adaptation in Alife and Artificial Natures approaches to Responsive Environments.\textsuperscript{69}

Diverse interactivity and responsivity modalities were used, according to artwork-appropriate approaches. Artworks 1) to 4) chronologically progress from:


\textsuperscript{65} See p172.

\textsuperscript{66} See p185.


\textsuperscript{68} See p34.

\textsuperscript{69} See p98.
1) Implicit environmental responsibility in non-responsive and metaphorically interactive works

2) Indirect and metaphorical environmental responsibility for a single-participant in a “reactive environment”

3) Direct, literal and instantaneous environmental responsibility for small group interaction in a semi-immersive Responsive Environment

4) Indirect, direct, literal, metaphorical, instantaneous and cumulative environmental responsibility for large group interaction in a highly immersive Responsive Environment.

Production was in the following domains:

1) Solo and collaborative performances: ephemeral works at theatres, performance spaces, festivals and in installations

2) Creation of original materials: ‘scriptwriting’, live action fiction filmmaking, computer animation, video art, music composition, sound design, architectural design, installation design, costume design, interface designs, photographic art, painting and sculpture

3) Design of intangible processes: concepts, methods and procedures for immaterial audience interaction and material audience interfacing

4) Technical: Electronic+Digital System design, Information Architecture (structure, organisation and operation of the real-time behaviour of Responsive Environments), computer programming, performative operation of computer hardware and software

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70 Dinkla 1996:281.

71 This term is not wholly accurate, as writing the non-linear, multi-channel and modular narratives for KY and Emergence was not in the traditional domain of a scriptwriting.
5) Logistics: Project Management (finances, administration, staging, publicity, funding, touring, building, dismantling), collaboration with other artists, designers, social scientists, computer scientists, electrical engineers, mechanical engineers and technologists.

Having outlined my PBR that is the subject of Chapters 4, 5, 6 and Appendixes A, C, D, E the following positions my motivation and rationale for my PBR.

1.5 Motivation and Rationale

My formal training is in art, I am an amateur in fields of robotic engineering, artificial intelligence and cognitive science. My knowledge is unsystematic, it has been acquired on the basis of need and interest. However my outsider status has allowed me an external and interdisciplinary perspective on research in these fields.

Simon Penny

Unlike Penny, my formal training is not in art, although I share his “outsider status” to this field of inquiry. My formal training is in anthropology and philosophy, however this thesis also draws upon my background in diverse art practices and artforms. While anthropology and philosophy influenced my PBR for KYv1, KYv2 and StilmS v1-3, my research and practice progressively moved in tandem toward the sciences of complexity, emergence, self-organisation, evolution and biology for StilmS v4 and Emergence v1-v3. These developments involved a progressive exploration of artforms that distribute responsibility between collaborative co-creators, and artwork and audiences composed not of groups of individuals, but of groups of teams as encouraged and facilitated by the artwork. This journey forms the backbone of this dissertation, as the following anecdote illustrates.

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73 See Appendix B: Curriculum Vitae.
1.5.1 Executing the Myth of the Tortured Artist

On a Saturday night in April 2005 I was at a party in Darlinghurst in Sydney. Amongst the merriment and fervor, I invited some friends and collaborators\(^{74}\) at the party to *Kingdom Come and/or Punch Holes In The Body Politic*, an avowedly political, topical and controversial “performance/installation/ordeal”\(^{75}\) that Mike Parr was staging a kilometre away at Artspace in Woolloomooloo. The work involved Parr sitting, standing and sleeping for 48 continuous hours, while wired up to receive electric shocks should any interactors’ movement intercept infrared beams placed within Artspace (Figures 1-1, 1-2, 1-3). He wore an orange uniform modeled on then detainees in Guantanamo Bay. The entire 48 hours was broadcast live on the Internet, including those interactors who entered the ‘active’ part of the space to give him an electric shock.

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\(^{74}\) One of whom was my closest collaborator for my artworks discussed in Chapters 4-6.

I led half a dozen friends from the party for an intended hour-long interlude, after which we would return to the party. We arrived at Artspace around 1am, only to find Parr on the far side of the near empty warehouse on the cold concrete floor in the fetal position, either asleep or semi-conscious, as he was too far away to tell. Although I had informed everyone he was 36 hours into the performance, we were initially disappointed, as we left the party to see ‘something’ other than a man asleep on the floor next to his urine bucket. We reconvened outside to discuss leaving or staying to see if ‘something’ happened.

In ‘Unassumable Responsibility’: Watching Mike Parr, Burvill’s article about his encounter in the same space some 14 hours before mine, he also found a deliberate ambiguity and absence of information about “What are the rules here?” and “What kind of spectator do I have to be here?” As a Performance Studies academic, who has personally known Parr and his work for many years, Burvill found that since the work had “no instructions” and “no warning” it provoked investigation on behalf of visitors “a behaviorist training of the spectator”76 as to what happened in the work and what they could and/or should do.77 He found that he “had sent students along and had tried to prepare them as far as I could, but I did not know in detail until after my own experience just what it was that Mike Parr had prepared.”78 Although knowing the artist statement and publicity from the Artspace website in advance, I also was not prepared for such uncertainty as to my roles and responsibilities. Due to Parr’s reservations about what power he potentially granted strangers, Jeni Porter wrote in Waiting to Get Wired, her review of the work, that the performance promotion “was so obscure [that] the event attracted virtually no

76 Burvill 2006a:3.
advance press” since Artspace was “wary of people getting their rocks off giving Parr shocks.”

Curious, I returned inside solo to seek the gallery assistant to ask about the etiquette parameters. The assistant pointed to two of the nearer vertical wooden beams and informed me that anyone could trigger an electric shock by walking in between them. The two beams were strategically and symbolically located very close to Parr’s chair, next to which he lay. To inflict pain required performatively walking ‘into’ the ‘active’ area and passing across Parr’s path. I went outside and informed my friends what was required if we were to see ‘something.’ We debated the ethics of doing such and whether it was better to wait to see if someone else would interact with the performance. We found ourselves facing the same challenge as Burvill. For “if we spectators hold back - ‘withhold’ our proximity, ‘keep our distance’, things are calm” since Parr is not “shocked, but then a large part of the ‘show’ will be inactive too.” In reference to Levinas’ “unassumable responsibility,” Burvill asks:

> How to assume this responsibility in this situation? What becomes of relationality and ethics in this ‘face to face’? Whatever this situation might metaphorise or thematise, conceptually refer to, what about my relation to the body of a guy I have talked to and liked, and in this situation, during this event, can only either watch dumbly and inertly, or hurt by my closer, intrusive presence?

For our group, these issues were amplified by making a collective decision about our collective actions (or inactions). None of us was willing to shock him, so we discussed options of “I’ll do it if you and you then do it” and “if we go through at the same time we won’t know who actually triggered the shock.” Eventually we agreed one of us would go first, followed by a second or third person, depending on the consequences of the first shock, as we had no gauge about what would happen. With so few people around Artspace at that

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80 Burvill 2006a:3.


82 In addition, Burvill reflects on what may happen: “If I go, and nobody comes, how long will he endure—without spectators? I feel the pressure of enforced non-communication build up in me.” 2006a:4.
time of night (the space is generally open during daylight hours only), I decided to take on this mantle, as the self appointed representative from our group. This also stemmed from our conundrum of comprising the majority of the audience during the time we were there, which arose from the “contradictory experience” that the work created, being “based on ethically compromising the spectator if at all possible by almost forcing them to hurt Mike.” The others seemed somewhat relieved, as three would see ‘something’ without having to interact with the work, while the other two could decide to not interact, pending my encounter.

I slowly walked forward between the two pillars under the watchful eye of the gallery assistant. I carefully and cautiously monitored Parr’s sleeping face as I did so, but he did not stir and ‘nothing’ seemed to happen. The assistant informed me he was so asleep he did not feel the shock, or the infrared sensors had not successively registered my presence. So I returned, to approach even more slowly. Suddenly Parr’s whole body convulsed and violently shook as the electrical charge shot through. The instantaneous and involuntary reaction shocked me, as he rapidly became alert, giving me a ‘death stare’ and yelling profanities at me. This only heightened my state of shock as Parr has an international reputation for highly demanding endurance performances involving self-inflicted and other-inflicted levels of pain that are unique in experimental performance art, let alone life outside courtroom prosecutions for violent assaults. Shamefully I returned to my friends on the other side of the warehouse, whom I noticed in surprise were also quite distraught. Two of the girls started crying, and the others were speechless. In silence, we returned outside Artspace to collect ourselves. I turned over my shoulder to take a last glance at Parr, now sitting on the chair with his head slumped and the gallery assistant tending to him with his hand on Parr’s shoulder.

After some moments internally processing our experiences, we exchanged perspectives about our respective responsibilities for the ‘something.’ Like Burvill, my sense of responsibility stemmed from “trying to be both an ethical and as much as possible the interactive spectator Mike

83 Burvill 2006b.
apparently wanted." My keeness to absolve myself of my guilt for what I had caused was uncannily met by confessions from the rest of the group who professed their sense of responsibility for being explicitly complicit in the ‘something’: none had argued against me doing what I did, even after the first pass produced no response. We realised that perhaps this was what the artwork ‘was’: an impetus to evoke environmental responsibility in all who attended, whether they regarded themselves as visitors (a.k.a ‘innocent bystanders’) or interactors (a.k.a ‘guilty participants’). The shock I triggered led to lengthy discussions between us as we walked back to the party.

Three years later I ‘met’ Parr, just before his lecture about his practice as part of his Artist Residency at ANU School of Art. A capacity audience awaited in anticipation. I advanced, to thank him for the above experience, and to apologise for my actions. I also approached in the hope, were he not angry with me for what I did, that I might interview him for this PhD. To my surprise, he remembered who I was after I told him what I had done. Little did I know, he remembered the incident as I was the straw that broke the camels back of that artwork: he was already near delirious (which the gallery assistant omitted from his summary of Parr’s condition when I enquired) and decided as a consequence of my shock to disconnect himself from the machine and terminate the performance. To have unintentionally exerted such an immediate and ongoing influence came as a further shock: for while I had known my individual responsibility was coupled with the cumulative collective actions of all that had gone before, what I could not know was that it had been so great that I denied the same possibilities for future attendees. The work embodied a performative equivalent to the artificial evolution described in the opening bricolage above, as in both the interactions of each individual amount to something beyond the sum of their parts: the emergence of the collapse of the work. And to make matters more bewildering, Parr greeted me with enthusiasm once he found out it was ‘me’ who ‘broke’ that performance, for he turned the tables by asking to interview me for a book he was co-writing about artist-audience interaction in his practice. In a strange moment of mutual respect and understanding, we both smiled and shook hands, before I sat to hear about his commanding and highly influential practice.

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84 Burvill 2006b.
The responsibility at the heart of the work was emphasised in Porter’s review. Her interviews concluded that all gallery staff were instructed by Artspace’s director [Tsoutas] that “‘if some dickhead walks in and just wants to get his jollies off’ to eject him.” However her review incorrectly reasoned about the caesura\(^{85}\) of the performance. Porter argued that “early on Sunday the only person Parr thought was a dickhead was Tsoutas himself,” based on Parr’s understanding, before we had the above discussion, of how the performance was broken:

About 2 a.m. the 60-year-old endurance performance veteran decided he’d had enough of sitting around waiting for someone else to zap him. He claims he turned off the power, slid onto the floor, and fell into a deep sleep only to be woken by a jolt delivered courtesy of Tsoutas reconnecting him.\(^{86}\)

In a manner redolent of the Inside-Outside relationship in Section 1.2 above, the ensuing consequences profoundly shaped my understanding of audience and artist responsibility in Responsive Environments. Burvill also found the work evoked an Inside-Outside relationship, whereby interaction with the social and physical environment of the artwork affects one’s relationship to the quotidian environment outside. From such associations, he rhetorically asked: “should the spectator respond both inside and beyond the performance space?” for “if so what might an ‘appropriate’ response be?”\(^{87}\) Two notable examples of my ‘answers’ include NoPainNoGain, a proposed iteration of Stilms v4 in which participants would collectively control my arms via electrode induced charges\(^{88}\) and the fictitious shocks administered by participants in Emergence v2.\(^{89}\) This involved a similar set up to the Milgram experiment whereby voluntary participants punished the protagonist of the work by whistling into a microphone, which simulated an acoustic-shock as played live by the actor on a video projection.

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\(^{86}\) Porter 2005.

\(^{87}\) Burvill 2006b.

\(^{88}\) See p236.

\(^{89}\) See p281.
1.6 Contributions

The Visual Anthropology PhD I began was initially titled Contributions to the Understanding of the Ownership of the Colour of Water. The title expressed an idea that humans stole the ‘colour’ of water from one another. It concerned how the ‘natural’ transparency and translucence of this water in the high Himalayas became ‘owned’ by the global forces of industrialisation and consequent environmental degradation in the Indian plains. As water first emerges brown (rather than clear) from beneath Himalayan glaciers, due in part to precipitous glacial melting, the responsibility for the ‘natural’ colour of water, which used to belong to those at the remote source, now extends to those downstream who have come to ‘own’ the premature colouration. The prism of human ecology was used to examine contending usages of the physical environment by pilgrims, priests, tourists, tourism operators, NGO workers, conservationists and activists around the Himalayan sources of the Ganga River. This PBR project could not be continued when I was denied a Research Visa to return to India in 2005, at which point I commenced the current topic.

The subject of environmental responsibility has persisted in my current dissertation, which also concerns opaque rather than incontrovertible contributions, like the variable opacity of water itself. Such contributions are through research-produced evocative art that harnesses insoluble qualities of indeterminacy and ambiguity over verifiable ‘contributions.’ In this PBR, “a creative artefact is the basis of the contribution to knowledge” as opposed to

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90 This was the working title from 2002-2004 and referred to Franz Boaz’s PhD Contributions to the Understanding of the Colour of Water (Department of Physical Geography, Kiel University, Germany 1881). When the PhD was formerly commenced in 2004 the title became The Idea of North: Pilgrimage and Progress in the Garhwal Himalayas. There were four interrelated components: a thesis, feature length ethnographic film, a DVD and a website containing and connecting all components. The ‘film’ would use multiple narratives representing diverse perspectives on environmental ethics regarding the Garhwal Himalaya. The subjects, issues, locations and methods were devised during six months preliminary anthropological fieldwork I conducted in India in 2003, following the Ganga from its Himalayan source to the sea in the Bay of Bengal. This topic was also the impetus for Kali Yuga and StilmS as discussed in Chapter 4.3 and 5 respectively.
Practice Led Research (PLD), wherein “the research leads primarily to new understandings about practice.”

This thesis addresses two related deficits. Not only have Responsive Environments received negligible critical analysis internationally, but relating Responsive Environments to environmental responsibility has not previously been proposed. As of March 2010, not one PhD cites Responsive Environments as any subject in the Australasian Digital Theses Repository while global PhD inventories reveal a similar absence. Furthermore, a Google search in May 2010 returned 718000 results for “environmental responsibility” and 41100 results for “responsive environments,” yet 0 results for “environmental responsibility in responsive environments.” Responsive Environments remain marginalised to intermittent, eclectic and ‘patchy’ discourse, due to the absence of a unified ‘field,’ corpus of texts, agreed approaches, debates on analysis, ‘school’ of artists, or accepted disciplines.

This is not a matter of terminology, but of critical understanding. FoAM decry the absence of a “consistent classification or evaluation mechanisms” for Responsive Environments, although they reason this stems from their indefinable and all encompassing properties, as they can “comfortably span approximately 20 existing colloquia” such as “an installation in a visual arts context; as a performance in a sound or theatre world; as a demo session on visual tracking by computer vision experts; or as a statistical usability lab for social scientists.” This is exemplified in Stephen Wilson’s Information Arts: The Intersection of Art, Science and Technology, which

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provides nearly 1000 weblinks to artworks and mentions dozens of specific and obscure categories, but does not mention Responsive Environments.\footnote{Stephen Wilson. \textit{Information Arts: Intersections of Art, Science and Technology}. Massachusetts: MIT Press. 2002. The cited artworks are listed at http://userwww.sfsu.edu/~infoarts/links/wilson.artlinks2.html. Accessed March 5 2007. In line with FoAM’s argument above, some artworks could be considered Responsive Environments as per the practices discussed in Chapters 2 and 3.}

Guattari and Carolyn Merchant’s critical theory approach to ecology,\textsuperscript{101} the complex technology integral to Responsive Environments limits the relevance of dialogue with such discourse or practices. Nevertheless, attempts are made to use the technologically intensive nature of Responsive Environments to evoke environmental concerns and to bridge such gaps. Armstrong’s PhD is particularly noteworthy in these regards as it pioneers a self-reflexive application of environmentalist principles to collaboratively create artworks that explore interactivity and responsibility. Armstrong’s contribution stems from “having observed how much new media art praxis operates largely without awareness of the ecological implications of those practices.” In response, he “began developing new processes for conceptualising and developing media art works”\textsuperscript{102} according to self-reflexive use of complex technology and ecological principles.

In tandem, this thesis contributes to the small, but growing, interest in bridging gulfs between art, science and technology; analogue and digital art; and environmentalism and Interactive Art. While bridging such gulfs is beyond the scope of this project, my “reflective practitioner”\textsuperscript{103} methodology enables the combined artworks and dissertation to be useful to similar practitioner-theorists and curators, critics and academics working in these fields of practice.


\textsuperscript{102} Armstrong 2002:91.

1.7 Methodology: Process and Praxis

My creative process doubles as a personal critical inquiry into ideas of relationship and interaction and the ways that the explicit mechanical interactive relationships made possible by computers change, challenge, enlarge and diminish notions of relationship and interaction.

David Rokeby

Like Rokeby, my PBR “doubles” as an investigation of relationships in my works and Inside-Out relationships evoked by my works as I oscillated between “hybridised” and “bricolage” methodologies for singular and collaborative practice and solo dissertation research. Rokeby does not refer to his art as practice, but rather “as a research practice” where staging works formed “a public research laboratory where my ideas about interaction and experience are tested, affirmed, or shot down.” The distinction, as applied to my PBR, is that being research practice, Rokeby’s works begin with “a couple of questions” principally about interactivity and interrelationships, wherein a resultant work will entertain “a dialogue within itself” rather than “end with a finished piece.” Similarly, creating my suite privileged process over product, via the “dialogue within” the successive iterations of individual artworks. This iterative design methodology harnessed what Bob Dick describes as the “emergent” nature of action-research, whereby I used “a cyclic or spiral process which alternates between action and critical reflection.”

105 Graham 1997:19.
106 Armstrong 2002:68.
While methodologies of collaboration lie beyond this project’s scope, it is necessary to account for relevant precedents that presage Chapters 3.5, 3.6, 4.3 and 6.2 on contemporary art collectives. Penny uses a similar PBR methodology over his long career involving an exceptionally wide skill set across disparate domains. Citing Petit Mal (1993-5) (Figures 1-4, 1-5), his “autonomous robotic artwork,” Penny “define[s] my research as ‘the aesthetics of real-space interaction’”\textsuperscript{111} through which Petit Mal simultaneously explores Human-Computer and Human-Human Interaction. For Penny, such “research emerges from artistic practice and is therefore concerned with subtle and evocative modes of communication rather than pragmatic goal based functions.”\textsuperscript{112} However this raises a methodological bind between artwork requiring artist-audience communication and the required collaboration and communication to create such work. While finding collaboration “a necessity” in his PBR, Penny argues that communication in collaboration is fraught with difficulties. As his production process “necessitates deep and sensitive engagement with people trained in disciplines so distant from the goals of art that conversation can, at times, seem impossible,” he argues that “solving technical problems and resolving communications issues among the collaborators is a labor in itself.”\textsuperscript{113}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figures.png}
\caption{Figures 1-4, 1-5: Simon Penny Petit Mal (1993-5)}
\end{figure}

\textsuperscript{111} Penny. 1997b.

\textsuperscript{112} Penny 1997b.

In contrast to the above two examples of PBR in internationally established artists, methodologies of collaboration are neglected in PBR PhDs. My methodology was deliberately grounded in recourse to a comparative corpus of recent PBR PhDs broadly representative of an emerging generation of practitioners undertaking similar projects.\(^{114}\) This involved ongoing discussions, collaborations, analysis of submitted PhDs and/or interacting with artworks produced for the Australian PhDs of George Khut, Greg Turner, Lizzie Muller, Chris Fortescue, Keir Smith, David Wolf, Robin Petterd, John Drummond, Karl Willis and Peter Fitzgerald.\(^{115}\) Importantly while Khut, Turner and Muller worked with one another (in various combinations) to realise their collaborative artworks for their PhDs, these collaborations were acknowledged as distinct contributions toward respective PhDs. For example, Muller’s PhD focused on audiences' understanding and experiences in the above mentioned collaboration, while Khut and Turner’s respective PhDs focused on separate but related aspects of creating the collaborative artwork. It was more appropriate to ground my own PhD in these PhDs of similar scope and subject, rather than the artists in Chapter 3 who are an earlier generation with established international art practices over their relatively long careers.

Of notable exception to this gap in the discourse is the collaborative methodology at the heart of Turner’s PhD: *Supportive Methodology and*
Technology for Creating Interactive Art. However this relates back to the distinction between PBR and PLD, as Turner’s PhD contributed “primarily to new understandings about practice” rather than contributing original creative artifacts through PBR. In contrast, Armstrong’s PhD contributes to understandings about creative processes arising from the specificities of the artworks produced for his PhD, rather than the theoretical focus on collaborative methodology that Turner’s PhD contributes. With a practice similar to Penny, Armstrong’s PhD likewise argues for the necessity of highly collaborative artwork production, despite periodically contested roles and responsibilities. Graham’s approach to this conundrum of collaborative bricolage methodologies poses a similar argument to Armstrong and Penny. Extending the “metaphor…of conversation itself” in the conversational interactivity in Individual Fancies (1997), her PhD artwork, to its production process was instrumental in bridging her difficulties for meeting the “demands [of] hybridity” between her respective roles as artist, practitioner and researcher for her PhD.

Creating such art stemmed from her metaphor of the artist as ‘host’ of a dinner party, like a facilitator “enabling community art.” Her ‘betweenness’ when staging Individual Fancies restrained her as a metaphorical rather than actual host. While she “want[ed] to help [interactors] all the time” with their interaction with her work, she decreed that she “must stand back and just give people the ‘tools’” as it was the designed responsibility of her self-sustaining artwork to engage audiences and not hers. These ‘tools’ allowed participants

117 Candy 2007.
118 Armstrong discusses such, one example (2002:80-85) being his collaboration with Transmute Collective on #14, an artwork made for his PhD. Similarly, Beth Jackson described Transit Lounge, another artwork made for his PhD, as “a major exercise in collaborative authorship, due to the very specialist nature of the expertise needed to realist the work.” Beth Jackson. Art and Interactivity – Are we Game? Broadsheet Magazine, 1999, cited in Armstrong 2002:245.
119 Graham writes: “I have to have many conversations with many people because the range of skills is so wide and the information not readily available. I have to persuade and bargain and give and take, and my ideas are often changed by other people’s opinions, like real conversation. I often seem to end up over real tea and biscuits, reflecting the artwork itself” as Individual Fancies involved participants having ‘virtual’ tea and biscuits. Graham 1997:227.
to considerably control Graham’s relatively ‘closed system,’ due to the metaphorically conversational role it offered audiences. In taking her metaphor and developing it in his context, Armstrong too sees this ‘host role’ as offering a methodology of collaboration. In his usage “such an interaction design” requires that the artist-as-host “may say little but can carefully facilitate the introductions that cement the overall success of the party.”\textsuperscript{120} He employed this strategy to negotiate the simplicity-complexity trade-off, as he found a ‘host role’ facilitated engagement with artworks with relatively simple form as “the complexity of response and operation can be brought to the work by the audiences themselves.”\textsuperscript{121} The parallels with my approach are discussed in my account of \textit{Stilms} and \textit{Emergence}.

\subsection*{1.7.1 Responsive Environments as all Encompassing ‘Field’}

While these PBR PhDs influenced my strategies for creating Interactive Art, few touch on environmental responsibility or Responsive Environments, let alone environmental responsibility in Responsive Environments. Accordingly, they were augmented by a comprehensive global online then \textit{in situ} survey of artists and artworks, to explore related approaches to combining content, form and Interaction Design to evoke environmental responsibility in a Responsive Environment. Search criteria aimed for a middle-ground of being inclusive enough to incorporate heterogeneous Interactive Art and Responsive Environments, but exclusive enough to form a comparative corpus of intrinsic rather than imputed connections between artists. Incrementally refining the criteria elucidated some of the pivotal contributions, by making more apparent what has and has not gone before.

Successively refining the survey filters eventually produced the following criteria:

\begin{itemize}
  \item \textsuperscript{120} Armstrong 2002:265.
  \item \textsuperscript{121} Armstrong 2002:265.
\end{itemize}
1) Artists who identify environmental responsibility as central to their work and/or for art in general
2) Artists who engage in reflexivity/critique of debates surrounding interactivity, authorship, control, complexity, narrativity, and environmental responsibility in their works and/or their writing about their work
3) Artists whose scholarly writing forms part of their art practice and whose art practice forms part of their scholarly writing
4) Artists with career trajectories that may reveal changes in their practice and ideas about responsivity and interactivity
5) Artworks which evoke environmental responsibility, whether or not they are considered Responsive Environments. This explored if artists in other disciplines and artforms share similar motivations to the selected corpus
6) Interactive artworks involving Artificial Nature, Alife, emergence, evolution, or adaptation
7) Interactive artworks where the content and/or modus operandi evokes interaction in an Outside environment
8) Co-created artworks involving collaboration between artists, technologists and scientists
9) Artworks staged in public access museums, galleries or outdoor public spaces

Despite rendering most ‘Interactive Art’ as irrelevant, these criteria highlighted extensive connections between the artists discussed in Chapters 2 and 3, who share similar motivations despite working in diverse artforms.\(^\text{123}\)


\(^{123}\) The artists listed are on p36 above.
1.7.2 An Exclusive ‘Field’ in Fieldwork

Knowledge of broader trends about who is working on what is supplementary to understanding the artforms through first-hand experience. Responsive Environments have particular properties that problematise second-hand information and understanding. Whether an unpredictably morphing garden maze or a hermetically sealed data-set of content, each encounter reveals literally and hermeneutically different facets for different participants. Unlike Benjamin’s dictum on The Work of Art in the Age of Mechanical Reproduction, requiring in situ experience resists the age of tele-presence and space-time compression. These works of installation art, many of which are ‘Editions of One,’ challenge the age of mechanical reproduction. They privilege process over product, as they offer dynamic processes that restore direct experience to primacy rather than ‘finished’ artworks. With relevant works seldom staged, principally due to formidable logistics and technical obsolescence, first hand experience itself becomes the precious commodity. Consequently, artist’s statements, interviews, websites, research articles, video documentation and reviews of their work became of primary importance.

Coupled with such barriers toward first hand experience, artworks are further hindered by sharing understanding of incommunicable or solipsistic experiences that emerge from different encounters with the ‘same’ work. To these ends, Graham’s “hybrid and pragmatic research methods” of curating and visiting works formed the “public research laboratory” for her quantitative and statistical examination of audience engagement. Her PhD concluded that many audiences did not reach/find/explore/encounter significant portions/areas/elements of many works due to their

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125 As installations and performative-installations can only exist in one place at one time (or between two or more simultaneous places in telematic art) they may potentially be unique and site-specific. Strictly speaking, artworks such as Stelarc’s Prosthetic Head (discussed on p69) are not unique or site-specific, as in this case three editions were for sale. As is the case with Rokeby’s artworks which have been sold as permanent installations, which may be considered ‘installation commodities.’

126 Graham 1997:147.

127 Rokeby 1998.
understandings of responsivity and their associated responsibility. This revealed a wide disjuncture between artists’ intentions and audience experience, which impedes the evocation of responsibility through artwork-audience interaction. Importantly this disjuncture existed in these works’ hermetically sealed form and Interaction Design, with all participant influence contained with pre-defined possibilities for their interaction (as was the state of the art at the time).

The disjuncture between artists’ intentions and audience experience is exacerbated in works involving evolving and emergent forms, due to highly variant responsivity-responsibility ratios. However, I sought such works during fieldwork in Germany, Austria, Holland, Belgium and England in 2006, involving visits to major festivals, galleries, museums and cultural institutions, and attendance at workshops, symposia and conferences. Observational analysis, non-structured individual and group discussions with audience members and/or interviews with artists were conducted with the few works relevant to the above criteria. This further problematised observational analysis of audience interactivity, as non-cumulative responsivity precluded the observation of how an audience adapted their behaviour in response to the changing behaviour of an artwork.

While encountering many aesthetically or technically innovative artworks, my response was similar to Armstrong’s fieldwork conducted six years earlier at the same principal sites. It was not possible to find a work suitable for conducting longitudinal research, in terms of where and when it was staged, Interaction Design and content. The very few that manifested any such properties were collapsed into the timeframe and attention span permitted amongst the fervour and fever of major international festivals or colossal group retrospectives. In his curatorship of Interactive Art, Huhtamo

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The organisations, exhibitions, conferences and festivals I attended in 2006 were: ZKM Centre for Art+Media, Karlsruhe; Today’s Art, The Hague; V2 Centre for Unstable Media, Rotterdam; De WaaG, Amsterdam; Crossmediaweek/Picnic ’06, Amsterdam; Steim, Amsterdam; FoAM, Brussels; Technopolis, Mechelen; The Institute for Contemporary Art, London; London Science Museum, London; Tate Liverpool, Liverpool; Tate Modern Art Gallery, London; Foundation for Art and Creative Technology, Liverpool; Ars Electronica Conference, Linz; Ars Electronica Centre, Linz; OK Centre for Contemporary Art, Linz; Lentos Art Museum, Linz; Time’s Up, Linz; and Kunstuniversitaet Linz: Lab of the Institute for Interface Culture, Linz.
has inveighed against how the mayhem of such carnivalesque forums is not conducive to evoking environmental responsibility in audiences.\textsuperscript{130} As a case-in-point, \textit{Time’s Up}, an international collective of interactive artists based about five kilometers from the colossal Ars Electronica (AE) Centre in Linz, Austria, launched their book about their collaboration with \textit{FoAM} during the 2006 AE Festival as a completely separate event from the AE Festival, despite working in the same ‘field’ of art. In conversation, both collectives explained they had disassociated from AE, because the types of Interactive Art promoted in such contexts were not conducive to the considered engagement they desired for their works.\textsuperscript{131} This stance is representative of the artists whose work I sought to experience\textsuperscript{132} but who had largely shunned the major international forums by the time I did fieldwork. This seismic shift among these artists is taken up at the beginning of the following chapter, and is further discussed in the case studies in Chapter 3. In light of what I termed the ‘Relevance of Irrelevance’\textsuperscript{133} I returned to focus on Australian works which I could experience \textit{in situ} and/or attend public talks with the artists to ask questions about their work.

\section*{1.8 Summary}

These broad brush strokes have established the stage within which this project sits. Having situated the rationale and methodology for the project, and the cultural context in which it is situated, the following chapter fleshes out the content that fills this stage, to illustrate what makes these art practices and research so pertinent to our times.

\footnotesize
\textsuperscript{130} This includes curating \textit{Alien Intelligence} (KIASMA Museum of Contemporary Art, Helsinki, 2000) and co-curating \textit{Australian International Video Symposium} (1994), ISEA (1994), \textit{MuuMedia Festival} (1990-92), \textit{Machine Culture: The Virtual Frontier} (1993), \textit{Toshio Iwai Retrospective} (1994), \textit{New Media Topia/New Media Logio} (1994) and \textit{The Vasulkas} (1992).

\textsuperscript{131} This was a conversation with Nik Gaffney and Maya Kuzmanovic from FoAM and Tim Boykett from \textit{Time’s Up} at the launch of their joint publication \textit{x-med-a} at \textit{Time’s Up} headquarters in Linz on August 5 2006. \textit{Time’s Up}, based in Linz is “a research institute using experimental situations as a means of investigating the behaviour of the public individual in everyday and nearly everyday situations.” \textit{Time’s Up Profile}. http://grig.info/partners. Accessed September 5 2008.

\textsuperscript{132} These are the contemporary artists discussed in Chapters 2 and 3 that are the subject of this dissertation.

\textsuperscript{133} That is, why the majority of Interactive Art is irrelevant to myself and those artists discussed in this thesis.