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

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Chapter 3: Case Studies - Context and Contextualisation

3.1 Introduction

In the preceding chapter, the challenges and issues related to evoking environmental responsibility in Responsive Environments were discussed ingredient-by-ingredient. These challenges and issues - negotiating the relationship between authority-control, determinacy-indeterminacy, simplicity-complexity, narrativity-interactivity and responsivity-responsibility when creating Responsive Environments- are collectively explored artist-by-artist in the five case studies that constitute this chapter. The artists were selected through a comprehensive global online then in situ survey of artists and artworks during fieldwork in Europe and Australia. The five artists/collectives comprise a corpus of shared concerns and motivations which combine content, form and Interaction Design to evoke participants’ responsibility to the artwork-as-environment. Similarities illustrate intrinsic rather than imputed connections, while differences demonstrate alternative ‘solutions’ for negotiating a balance between their authorial responsibility and participants’ responsibility.

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324 This process and the selection criteria are described in more detail on p56.
The case studies illustrate trends between these same generation of artists, who mutually influence one another’s explorations of responsibility and interactivity in highly complex and technologically demanding artworks. Garth Paine, Jon McCormack and David Rokeby represent individualistic practice with intermittent collaboration on conceptual and/or technical aspects. When collaborating, their authorial responsibility, as instigator and director, is maintained. In contrast, the fourth and fifth case studies of Keith Armstrong/Transmute Collective and FoAM concern collaborative collectives.

Each case study explores key ideas from core artworks in the artist’s career, in light of Huhtamo’s “archeology of interactivity.” The focus is on seminal interactive artworks relevant to the topics of this dissertation, including the period when interactivity was eagerly embraced in the early 1980s, before being largely rejected or criticised by Huhtamo’s “‘old school’” by the late 1990s. The case studies present a detailed chronology of the broad shifts of practice discussed in relation to the State of the Art of Responsive Environments in Chapter 2. Huhtamo’s “archeology of interactivity” looks at divergent approaches to creating Interactive Art in the career trajectories of pioneering ‘old school’ Euro-American artists, as leverage to unearth a “‘metacommentary’ on the state of interactivity.” He argues that the practice of these artists “raises ethico-philosophical issues” as it “continuously de-mythicises and de-automates prevailing discourses and applications of interactivity from the inside,” such that their specific trajectories reveal wider trends and patterns of “a cultural critique of the nature of interactivity.” This argument is applied to the case studies which follow, including Rokeby, who was the main subject of Huhtamo’s “archeology of interactivity.” The case studies also expose “a cultural critique of the nature of interactivity” which is not concerned with geo-sociological art trends, as the Australian artists I have included practice and exhibit internationally. Nor do they form a ‘portrait’ of contemporary Australian Responsive Environments, as they operate against dominant trends in Interactive Art (as per Huhtamo’s above “‘metacommentary’ on the state of interactivity.”)

325 Huhtamo 2006.
326 Huhtamo 2004:1. These artists are listed in Footnote 142.
327 Huhtamo 1995:81-82.
Each case study is broadly chronological, tracing the evolution of strategies for evoking responsibility to Inside (social, physical) and Outside (quotidian, natural) environments in Responsive Environments. With upwards of 20 years of professional practice each, the artists' works oscillate between outright interactive/responsive, satirically interactive and relatively non-interactive, with interactivity embraced as one component for some works. In tandem, the artists' works oscillate between evoking individual and collective responsibility in direct, indirect, literal, metaphorical, instantaneous, cumulative and collective domains. Alongside diversity within each trajectory are shared explorations of intersections between art, science and technology; for instance, all the artists used chaotic, unpredictable weather patterns as impetus for interactive installations, all made artworks about and/or with natural/artificial gardens as subject and/or modus operandi for interactivity and responsivity and all exhibited/performed at Ars Electronica yet maintained an ambivalent relationship with such a dominant context for presenting and critiquing Responsive Environments. Their use of different interfaces -such as haptic, tactile, kinaesthetic and proprioceptive processes- illustrates a diversity of Interaction Design strategies which add up to a multi-faceted portrait of disparate but related artforms whereby each facet contributes, on balance, to a corpus which transcends any one artist, collective or artform.

These five case studies contextualise the journey of my practice, which also oscillates between different approaches to interactivity and responsivity, as the following three chapters discuss. Resonances and connections with my practice chiefly are found in these artists' rhetoric and rationale rather than shared formal properties, as they herald from an earlier generation with established international art practices over relatively long careers, while my suite of artworks for this PhD are proof-of-concepts domestically produced and exhibited with limited resources, time, equipment and experience. For example, their practices generally constitute Alife inspired aspirations toward “art-as-it-could-be,” by using Alife scientific processes, or technological sophistication of equivalent complexity, while my practice is generally Blife in

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328 This is discussed on p66 of Chapter 2.
the sense of “art-as-it-actually-is”\textsuperscript{330} by using an “‘under-engineering’ approach”\textsuperscript{331} with humans or biological materials (rather than programmed machines) as the mimetic agents of simulated adaptation, evolution and emergent behaviour. For this reason, it was more appropriate to ground my PBR in the corpus of recent PBR PhDs as representative of an emerging generation of practitioners, discussed on p54 of Chapter 1, without ignoring relationships such as that between my \textit{D\#Generative} (2005-8) and McCormack’s \textit{bloom} (2006) and \textit{Morphogenesis Series} (2001-4), where these occur.\textsuperscript{332}

3.2 Case Study #1: Garth Paine

Unless the system changes in response to accumulated user input…it is essentially responsive, and not interactive. I have therefore used the term, interactive responsive environment to describe my installations, which I believe herald a journey towards true interactivity.

Garth Paine\textsuperscript{333}

The following section discusses Garth Paine’s “journey towards true interactivity” in his suite of artworks made for his PhD between 1996-2000, as this journey highlights fundamental issues in creating Responsive Environments (and the similar journey undertaken in my PBR). Paine’s PBR evokes co-participants’ responsibility to the social and physical artwork-as-environment through prioritising highly responsive Interaction Design over content and form. This is facilitated by working in the relatively malleable medium of sound, as sound can be generated in real-time synthesis with minimal pre-authored or pre-structured content or form (relative to visual, textual, haptic and tactile mediums). Using reflective practitioner and iterative design methodology, Paine chronologically moved from more authoritatively...
controlled “‘triggered’ systems” toward highly responsive works generating audiovisual content according to real-time and cumulative patterns of participant interactivity. His Responsive Environments have been staged since 1996 in Australia, Europe, Japan, America, Hong Kong and New Zealand. As an “Academic, Composer, Installation Artist, Sound Designer” his PBR explores the role of interactivity and responsivity in “Sound Installation Works that engage with the environment and the people within them,” principally through sensing unencumbered movement of co-participants within the environment.

In his article, *Interactivity, Where to From Here?* Paine criticises “widely abused” interactivity in electronic art. He aligns himself with artists such as Penny, who also “sets out to avoid” the “standard interactive paradigm... based on pre-determined paths through pre-constructed environments.” For participants to have a high degree of responsibility to the physical environment of the artwork Paine seeks “to remove pre-made or pre-defined content from the installation works” through real-time sound synthesis based on participants’ movement, as this creates “forms of interaction that contain as few predetermined factors as possible.” In this context Paine regards his authorial responsibility as being to “remove myself from the role of content creator and dictator of interactive outcomes.” He situates his intention within Surrealists and Fluxists, as he likewise seeks “to remove myself, as much as possible, from imposing an aesthetic; a collection of outcomes, a form, or a prescriptive experience,” as these are inversely proportionate to participants being able to “mould their own individual experience.” His contemporary influences are Sommerer, Mignon, Rokeby and Krueger, although, like

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337 Paine 2002a:3.
Rokeby, Penny and *FoAM*, Paine departs from Krueger’s predominant use of surveying participants to detect absence versus presence, in favour of artificial perception systems that sense and analyse the subtlety and nuance of participants’ movement. Paine evoked participant responsibility in *MAP1* (1998), “an immersive interactive sound environment installation,” by “shifting” his role “away from content determination,” using “very little pre-made content” in conjunction with generating real-time sound synthesis from participants’ movement. This made actualisation “more within the visitors control” as he placed “ownership of the experience onto the user” to the extent that participants could submit their own audio content to be incorporated into the sound matrix that they interacted with in *MAP1*.

Paine argues against dominant modalities of Interactive Art, wherein the artist-audience relationship is analogous to the artist as conductor of the audience as chamber orchestra. Only conversational interactivity “is extremely dynamic,” with audience and artwork “constantly monitoring the responses of the other and using their interpretation of the other parties input to make alterations to their own response strategy.” Like Rokeby and Graham, Paine models his Inside physical environments on the Outside quotidian environments of “everyday” interaction of “human conversation,” wherein “each exchange…must reflect the unique qualities of each particular dialogue.” To achieve this, dialogical interactivity must be “capable of changing and evolving” by “reflecting the developing relationship or discourse between artist, artwork and audience. However this ‘evolution’ is partially predetermined, given his caveat that it “must promise continually new outcomes” wherein “responses alter in a manner that reflects the cumulative experience of inter-relationship.” This argument hinges on Paine’s criteria that artworks should be semi-autonomous with “a level of cognition,” by which criteria “most

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342 Paine 2002a:52.
346 Paine 2002b:5.
systems” without this capability are not “interactive, but simply reactive or responsive.”

While this cognition is unspecified, the “level” of cognition requires an “infrastructure that could establish the patterns of interaction based on historical knowledge, and act accordingly.” Ideally, “the system” (as artwork) would be “trained to analyse the aesthetic output of the interactive system” to create the possibilities of “algorithms of an interactive, responsive environment evolving over time.” The desired result would see the “response patterns of the installation adapt to an accumulated knowledge” regarding participant interaction. However this would significantly raise participants’ authorial responsibility as the cumulative consequences of their interactions would “totally discard the algorithms the artist/composer(s) established for the piece.”

Such responsibility may be onerous, as it would require participants “to develop a cognitive map of the relationships between behaviour and environment, between action and reaction, between individual and communal.” This refers to the conundrum discussed in Chapter 2, wherein complex responsivity through dialogical interactivity necessitates correspondingly high levels of participant responsibility. In particular, Paine’s oeuvre demonstrates the complex endeavor of evoking responsibility in many-to-many interaction with a physical environment that evolves, wherein participants negotiate between individual and collective responsibility as environmental stewards.

In his PBR, Paine aims to evoke environmental responsibility through reciprocal relationships between participants and the physical environment, wherein participants’ “behaviour creates the environment, and the environment conditions their behaviour.” This is prescriptively applied, as he argues participants’ experience “should” involve “a symbiotic relationship with the

348 While not defining “accordingly,” or specifying the “level,” he suggests “neural networked computing” as the necessary “software infrastructure.” Paine 2002b:10.
350 Paine 2001:3.
351 See p83.
work that permits a real sense of freedom of interaction.”352 This is possible only if enjoyed by both artwork and audience, as it is self-contradictorily undermined by his works like *Ghost in the Machine* (1997), “an immersive interactive Audio/Visual environment Installation,”353 where participants were “able to command the environment” and “to play” it like an “instrument.”354 Under Rokeby’s influence, most of Paine’s PhD artworks were created with Rokeby’s *VNS Software*. However *VNS*, Rokeby’s principal work created with *VNS Software*, was designed to not be an “instrument that you play with your body” due to the connotations over the “level of control” Rokeby found in such a relationship. Nevertheless, participant-environment reciprocity existed from *Ghost in the Machine* inverting the roles for participant and artwork relative to *Moments of a Quiet Mind* (1996), his preceding installation. *Ghost in the Machine* required participants to “move more and more rapidly” to “maintain a serene state” of the real-time behaviour of the audiovisual content. Participants were informed by the program notes that each “acts as an irritant to the space” that was pre-determined to be “soothed” by more chaotic human behaviour. This text was an adjunct to the responsibility to natural environments evoked in the work, as the program notes declared that “the environment reverts to a serene state”355 without participants.

Subsequent artworks negotiated responsivity-responsibility relationships by attempting to balance the number of co-participants with the mode of interactivity. *MAP2* (1999-2000), an “interactive sound environment installation,”356 offered “an environment in which people can consider the impact they make on their immediate environment and the causal loops that exist between behaviour and quality of environment.”357 In this work, Paine used “balance” as the “required” principle for causal determinacy between “mappings that were immediately perceivable, and mappings that provided

357 Paine 2002a:58.
complex, multi-faceted responses.” Causality in his earlier deterministic “triggered’ systems” was now balanced with “complex and multifaceted” interactivity involving indeterminate causality between participants’ actions and the ensuing effects on the physical environment. As he desired for participants to enter into “causal loops” of cybernetic feedback, Paine applied the caveat that causality should not be “obscure or indeterminate.” His solution to these mutually exclusive properties was to balance the complexity of the interactivity with correspondingly appropriate numbers of co-participants.

This involved re-appropriating the exploration of his earlier Moments of a Quiet Mind and Ghost in the Machine which aimed for “a balance within the [installation] space” between the intensity of individual participants’ behaviour and the feedback cycles they exerted on the work. In Moments of a Quiet Mind, balancing the number of co-participants with corresponding complexity of interactivity aimed to encourage participants “to consider the relationship between the ‘perceived’ and ‘actual’ consequence of behaviour.” While this “advocated an intermediate level of behavioral intensity, a middle way,” making participants’ respective influences apparent was hindered by their engagement with cumulative responsivity from the collective interaction from all previous participants. Consequently, “inhabitants” were given “no option but to develop a communal language for the exploration of the installation.” This common (spontaneous) “language” required developing spontaneous “communal agreements as to what distinguishes a preferential environment, and what characterises preferential behaviour.”

Like Krueger, Paine also found that participants “wanted to see a direct and immediate relationship” between the consequences of their interactions, to offset being “unsure what the outcome of their individual activity was within the space.” Paine’s solution was to make causal relationships more discernable through having minimal simultaneous co-participants and encouraging repeated

362 The term used by Paine to describe those interacting with his works.
attendances with different volumes of co-participants, so participants could “explore the interactive potential of the installation to its fullest,” as exemplified in Gestation (2003).

Paine’s exploration of the balance between complexity of interactivity and appropriate numbers of co-participants was an important reference point for my Stilm and Interaction Design for Emergence. Likewise, his candid reflections on these challenges are discussed in the sections on Transmute Collective and FoAM below. While these artists share an exploration of synthesized evolution and adaptation in their artworks, the practice of the following artist, Jon McCormack, forms the apotheosis of balancing the number of co-participants with responsibility for co-influencing Responsive Environments that ‘evolve.’

3.3 Case Study #2: Jon McCormack

A pristine new nature begins to form in a remote inner chamber. Supported by expensive, sophisticated technology, this nature offers several advantages over the rapidly unravelling original. It is enormously malleable; it might resemble the ‘old’ nature or some fantastic environment of our own imagination. Being immaterial, it is entirely benign; it won’t eat, poison, flood, or otherwise disturb its human inhabitants. Rather, it can be truly Edenic, the ultimate garden, in fact, finally under complete control.

Mitchell Whitelaw

Whitelaw’s argument touches on the issues of evoking responsibility to natural environments in Alife art, as he goes on to critique this evocation in Sommerer and Mignonneau’s Alife “interactive environments.” Whitelaw’s critique partly describes Jon McCormack’s practice, as he argues that McCormack “offers one option for addressing this tension,” through his

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365 See p216.
366 See p268.
368 Whitelaw 2004:216. The issues of doing so in their practice are discussed on p104.
“critical reflexivity” of using optical Alife art to self-reflexively evoke Biophilia for a “poetic and romantic attachment to the sublime, and the biological.” This distinguishes McCormack from dominant optical Alife art practices, exemplified by Sommerer and Mignonneau, which “model and mirror an idealised nature” by offering interaction with “a benign, controllable, anthropocentric cybernature.” For Whitelaw, while “the natural remains central” in McCormack’s work “as an aesthetic necessity or an object of poetic reverie,” the “purity and artifice of this cybernature is used reflectively, to draw attention to its culturally grounded process of computational renovation.” The following discussion focuses on how McCormack addresses this tension to evoke responsibility in his interactive works made between 1994 and 2006, as his endeavours in photography, making short animated films and as a mathematician and computer scientist who writes proprietary software are secondary vehicles for his evocations of environmental responsibility.

As an “electronic media artist and researcher in Artificial Life and Evolutionary Music and Art,” McCormack shares common concerns with Paine and FoAM. McCormack’s recent interactive artworks, such as Eden (2000-2006), strive for an Artist-Artwork-Audience relationship similar to Paine, involving a “a symbiotic relationship” between participants and “reactive” immersive “artificial ecosystems” that have been staged in America, England, Austria and Australia. Despite the overt environmentalism present in artworks since 1986, McCormack appears fatalistic about quotidian environmental responsibility:

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369 Whitelaw has also written about McCormack’s artwork, see Whitelaw, Nature by Numbers, Volume 9:38-39. He also undertook a residency at the Centre for Electronic Media Art, Monash University, which McCormack is Co-Director of.
370 McCormack 2003:3.
372 Whitelaw 2004:100.
374 McCormack 2003:3.
375 McCormack 2003:3.
I am sad for this loss of real landscape, and naturally, most people will be. But the less anthropocentric view holds that sadness, morality, pride and beauty are only human concepts. Nature, in the Victorian view, ‘red in tooth and claw’ continues on: automatic, oblivious and inevitable.\(^{377}\)

McCormack’s practice evokes responsibility to natural environments by using interactivity to explore Edward Wilson’s Biophilia\(^{378}\) on the subject matter of how humans “relate and view nature and artifice, design and synthesis, creation and evolution.”\(^{379}\) To do so, he utilises what critic Rob Harle terms a “paradoxical” practice wherein “by creating artificial natural worlds he forces us to consider the real natural world and how we are destroying it at an alarmingly disconcerting pace.”\(^{380}\) Monro, in another review of McCormack’s career, similarly argues that his practice pivots on “human alienation from, and destruction of, nature.”\(^{381}\) Yet unlike avowedly activist art, McCormack’s work poses the question that if nature “is denied to us, can generative art provide a fulfilling replacement?”\(^{382}\) He suggests this possibility through his artwork offering an “expression of a new nature” that may “expand our experience of the natural.”\(^{383}\) However, in response to McCormack’s evocation of responsibility to natural environments through such “strategies” of “artificial nature and artificial life” and similar approaches of Paine, such as Paine’s *Reeds* (2003), Armstrong argues McCormack and Paine “risk perpetuating our existing misunderstandings of ecology as they mine it for often-inappropriate


\(^{379}\) McCormack 2004a:3.


\(^{382}\) Monro 2005.

\(^{383}\) McCormack 2003:18.
metaphors.” Before turning to how this plays out in McCormack’s seminal artworks, it is important to discuss how he arrived as such a position.

Central to McCormack’s position is the material substrate and subject of technology. For McCormack, computational processes inextricably shaped his “ideas about the world” by revealing “things about the world that I could not have known, understood or seen any other way.” The result was that “I see and appreciate nature in a fundamentally different way than before.”

His connection between this “new nature” and computational process arises from his aims “to adapt, on a metaphoric level, the mechanisms of biological evolution in order to develop new approaches to computational creativity” such that “processes from biological ecosystems serve as inspiration for computational artificial ecosystems.” He arrived at such a position due to his speculations about future human-technology-art relationships:

As our dependence on technology increases, and as the complexity, subtlety and intimacy of the human-machine interface develops it seems that our next major evolutionary steps will involve an interrelationship with our technology. Ideas and techniques being developed now give us some glimpse into the nature, and the future, of ourselves.

How this “new nature” addresses the tension between evoking responsibility to natural environments through Alife is apparent in his core works. Two early works, *Four Imaginary Walls* (1991) and *Wild* (1994), were presented as a “responsive Virtual Environment”/“interactive virtual sculpture” and an “interactive environment” respectively. “Responsive” and “interactive”

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are used interchangeably, referring to Huhtamo’s internalised “System Interaction”189 whereby *Four Imaginary Walls* responded to environmental sensors of wind, rain and temperature while *Wild* used these sensors with peripheral sensing of audience behaviour.

The next artwork, *Turbulence - An Interactive Museum of Unnatural History* (1995) (Figure 3-27), was his first involving direct audience interaction. It comprised a data-set of “abstract thoughts, simulations, ideas, information and poetry, all a multiplex of links into an interactive web”390 of pre-generated digital animations prosaically described by Gordon Monro as being “fairly short video segments...which the viewer of the installation could call up using a touchscreen”391 (Figures 3-28, 3-29, 3-30). McCormack used the term “interact” to describe audience processes of ‘natural selection’ “by pressing on words and symbols” on a touchscreen in front of the projection screen, which triggered projections of “selections from the videodisc”392 of the Alife flora (Figures 3-31, 3-32, 3-33, 3-34). This evokes problematic ‘aesthetic evolution,’ as used in Sim’s *Genetic Images* and Sommerer and Mignonneau’s Alife art discussed in Chapter 2,393 wherein interactivity with “the evolutionary process” underpinning *Turbulence* “permits ‘survival of the most beautiful or aesthetically interesting’ as opposed to ‘survival of the fittest’ as in evolution on Earth.”394 McCormack self-reflexively undermined any notion of ‘progress’ (as conflated with ‘evolution’) as the structure and form had “no start or end to the work” but instead adapted whereby “the software ‘learns’ about which areas the user is exploring and responds with inter-related options” so that it “tries to adapt to the personality and whims of the user.”395

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189 Huhtamo 2004:6
190 McCormack 1995.
191 Monro 2005.
193 See p102.
Figure 3.27: Jon McCormack Turbulence (1995) installation schematic


Figures 3.31, 3.32: Installation views of Turbulence, showing the touchscreen interface on the plinth in front of the projection screen

Figure 3.33: Detail of the Turbulence touchscreen interface

Figure 3.34: Installation view of Turbulence
Within this lies a central conundrum: *Turbulence* expressed “poetic musing on the philosophical implications of evolutionary theory and artificial life” while being a “technological investigation into the possibilities for life-as-it-could-be.” Despite depicting “biologically inspired” ‘ancient’ Blife in an artwork subtitled an *Interactive Museum of Unnatural History,* the optional title was *The Beauty to Be* as it depicted extinct “futuristic” species to represent “a new and different perspective on nature and our relationship with nature.”

The etiquette of museological behavior was conveyed by placing “specimen jars that contain preserved examples of biological life” along the dimly lit walls of the dark room, with Blife forms in the specimen jars that “relate in some way to the video sequences on the disc.” Such etiquette was also evoked through “exhibiting the work in unique and special spaces that relate contextually to the work itself” such as “zoos, herbariums” and “glasshouses.”

The one-on-one interactivity in *Turbulence* determined why *Eden,* McCormack’s later interactive artwork, had many-to-many interactivity with greater responsivity. Numerous stagings of *Turbulence* convinced McCormack that one-on-one interactivity impeded the evocation of participant responsibility as it was mostly experienced with one-to-many interactivity, wherein numerous attendees created a social responsibility for the participant to performatively “entertain” those unable to interact at that time. McCormack found this created undesired “pressure on the operator” at the expense of time “taken to examine the interface or experiment with its controls.”

396 *Turbulence* credits are: “direction, animation, software, evolution, music and sound design, Jon McCormack” from McCormack 2004a:95. “Evolution” was credited alongside more verifiable authorship of “animation” and “software.”

397 McCormack. 2005b:89.


399 McCormack 1995.

400 Dorin 2004:84-5.

401 Dorin 2004:84-5.
reflection.”

In contrast, *Eden* strove for “an evolutionary relationship” with co-participants engaging through indeterminate causality and complexity, yet without an “explicit need to learn the language of interactivity of the system.” This negotiation between the indeterminacy of participants’ influences and the complexity of *Eden* encapsulates McCormack’s view that participants have a responsibility to “learn the language,” as he terms his artworks’ “reactive systems (as opposed to interactive systems).” He finds interactivity “needs a language” to have “any meaning,” which places onerous responsibility on participants to “learn or re-learn a language specific to individual works.” By making his artworks “reactive” McCormack avoids imposing such responsibilities as they contain “no stipulated language or simplistic action-reaction mechanisms.”

Nevertheless, *Eden* illustrates co-participant responsibility to the social and physical environment of the artwork which ambiguously evokes Outside responsibility through systematic Alife art. Described as a “Self Generating Ecosystem” and “evolutionary sonic ecosystem,” *Eden* senses participants’ distance and movement around four projection screens on which are depicted cellular automata animation of microbial-like agents ‘hunting-and-gathering’ for food (Figures 3-35, 3-36, 3-37, 3-38, 3-39, 3-40). The behaviour of the agents generates a corresponding soundscape, which is fed-back to participants in loudspeakers placed around the perimeter of the installation. Responsibility to the natural environment, represented by the agents’ artificial environment, is ambiguously evoked since participants’ proximity to agents’ environment is equated with “a fertile environment” of the depicted population of agents and the correspondingly ‘robust’ sounds. Rather than perturb the health of the agents (as would overwhelmingly be the case in natural environments), *Eden* represents them as benefiting from maximal proximity to humans. McCormack argues the agents “evolve to make complex sounds” to

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402 Dorin 2004:84-5.
403 McCormack 2007a:301.
407 McCormack 2004a:102. Interestingly, unlike Turbulence, he does not include a credit for “evolution.” The only credits he gave himself are “software and sound design.”
“produce...interesting, changing sounds,”408 as keeping participants ‘interested’ encourages them to move nearer the projection screens, which the agents use in their attempts at “improving chances of survival in the environment.”409 This occurs since an agents’ survival is determined by relative health, power and population, with agents gaining strength by drawing

participants closer to the screens for longer periods of time. Self-reflexivity was used to comment on how agents “implicitly” evolve “to maintain the interest of the human audience,” whereby Eden comes to serve participants, as they implicitly use the physical environment (represented by Eden) for their own aesthetic interests. In relation to this tension between evoking responsibility to natural environments through Alife art, his major reflection on Eden, “Evolving for the Audience,” would be more accurately titled ‘Evolving with the Audience,’ as Eden was reactive rather than interactive (as per his classification described above).

McCormack’s use of audience-artwork interactivity to constitute such a “symbiotic ecosystem” is employed to highlight participants’ responsibility. His judgment that ‘evolving’ sounds produced over multiple stagings were due to participants’ behaviour having a “positive effect on the evolution of agent’s genomes” expresses his stance on evoking participants’ responsibility. Contrary to suggesting a “positive effect” on the physical environment of the artwork, the underlying effect of human presence is expressed in the title denoting an edenic environment. Like “the environment” of Paine’s Ghost in the Machine which also “reverts to a serene state” without participants, Eden suggests ambivalence about participants’ influence on the environment of the artwork. Indeed, in contrast to the social responsibility explored in Eden, the work was “inspired by time spent in the wilderness of Litchfield National Park, Northern Territory, Australia.”

McCormack evokes Outside responsibility to natural environments as his ‘muse’ for evoking Inside social and physical responsibility in self-reflexive Alife artworks that ambivalently engage participants. This is conveyed in his summary of how his time spent alone in nature forms the impetus for designing responsivity and responsibility within the complex networks of his artworks:

I spent many days alone at the [Litchfield] park, observing the activities and sounds of a multitude of insects….this time brought to the forefront my concept

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411 McCormack 2006.
of an ‘ecosystem’ – of how it describes a vast and complex network between living things, and how this is at odds with the phenomenological experience of being in such an alien environment without human contact.\(^{414}\)

McCormack’s approach resonates with my PBR through a mutual inclination to incorporate personal understandings of “ecosystemics”\(^ {415}\) in artworks which evoke responsibility by conflating Inside with Outside environments. While McCormack approaches these ideas with the training of a mathematician and computer scientist, my PBR approaches similar terrain with more indirect and metaphorical responsivity through the relatively simple technological substrates used. Alongside specific resonances, such as between his *bloom* and *Morphogenesis Series* and my D\#Generative (discussed in the following chapter on my practice on p179) I too employ nature as ‘muse,’ having spent many an hour observing the “ecosystemics” of termites and their mounds at Litchfield National Park, which McCormack was likewise attracted to as the mounds in Litchfield are considered some of the finest examples of self-organisation, swarm behaviour and emergent phenomena in eusocial superorganisms.\(^{416}\)

To illustrate alternative, but complementary, approaches to addressing the same issues of McCormack and Alife art, the following case study explores Rokeby’s evocation of Inside and Outside environmental responsibility. This takes place with “approaches and technologies used by other kinds of interactive works,” by which he refers to Alife art+science, although he does not seek evolution, emergence or adaptation, the “Holy Grail” of Alife art, in his practice. However he sees his approach to Responsive Environments as complimentary to McCormack’s, as Rokeby finds in Alife art that

\begin{quote}
it is not the individual interactor who is reflected in these works so much as human behaviour itself. In a sense, the Responsive Environment [i.e. Rokeby’s practice] and the Automaton [i.e. Alife art] complement each other, representing both sides of the relationship between man, and the social and natural environment.\(^{417}\)
\end{quote}

\(^{414}\) McCormack 2004a:102.


\(^{416}\) How these formed the impetus for my Interaction Design for Emergence is discussed on p259.

\(^{417}\) Rokeby 1995b.
3.4 Case Study #3: David Rokeby

Because the computer is purely logical, the language of interaction should strive to be intuitive. Because the computer removes you from your body, the body should be strongly engaged. Because the computer’s activity takes place on the microscopic scale of silicon wafers, the encounter with the computer should take place in human-scaled physical space. And because the computer is objective and disinterested, the experience should be intimate.

David Rokeby

David Rokeby has been staging pioneering interactive installations in “galleries, trade shows, science museums, and public and private spaces” in Austria, Germany, England, Scotland, Italy, Finland, Belgium, Canada, America, Japan, South Korea and China since 1982. The following discussion focuses on his strategies for evoking participants’ responsibility, according to a chronology from explicit (1983-1990) to implicit (1991-2003) audience interactivity (Figures 3-41, 3-42, 3-43, 3-44) to excluding audience interactivity in his System Interactives (2004-present). Reference is made to Rokeby’s theoretical citations I quoted in the two previous chapters. Unlike the other artists discussed in this chapter, analysing Rokeby’s ouvre benefits from significant critical discourse concerning his practice.

Huhtamo considers Rokeby exemplary among interactive artists and extrapolates from his changed stances on interactivity to the wider movement among the “handful of artists” that Huhtamo finds “fully justified” in terming their art ‘interactive.’ This movement is conveyed in a telling anecdote Huhtamo relays about Rokeby’s self reference on his 1988 card as “interactive artist,” which he doubts was the case by 1998. Indeed, while Rokeby’s website has not been fully updated since 2000, in 2007 his website title was “Media Installation Artist” and in 2009 just “Installation Artist.” On his website his career is divided into a “first part” which “focussed on interactive” art and


Rokeby outlined his ideals for how responsivity and interactivity could remain worthwhile artistic endeavours in a 1996 lecture. Citing the examples of human-human verbal and oxygen-carbon dioxide exchanges in quotidian environments, he decried that “interaction itself is banal.” Using his practice as “an attempt to recover” Interactive Art from “being crushed under the hype surrounding...‘Interactivity,’”\footnote{Rokeby 1996.} he argued it could be purposeful if “used when appropriate” as “merely another tool in the artistic palette.” He hoped it would resume “its natural role as a tool for exploring and critiquing relationship

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\textsuperscript{421} Rokeby 1996.
itself,” although this would first require that “the hype dies away.”422 Within two years, Huhtamo was lamenting Rokeby’s “change” or “rupture” in moving from “unrestrained enthusiasm as an almost orgiastic celebration of the possibilities of interactivity” in Very Nervous System (VNS) (1982-2004), to “discursive explorations” in Silicon Remembers Carbon (SRC) (1993-2000), Measure (1992-94) and Watch (1995) that explored “pessimism or doubt” about the “changing implications of interactivity.”423 These shifts stemmed largely from Rokeby’s stances on appropriate responsivity and concomitant audience responsibility. In an interview in 2003, Rokeby reflected that interactivity had been “guilty of over-sensationalising and diminishing critical distance,” which he tried to balance with “experiential grounding” in VNS (Figure 3-46). Finding this attempt not “successful,” he skewed his practice to “more consciously create spaces for reflection and distance”424 within their interactivity. How these strategies were explored is now discussed with reference to his career trajectory.

As well as his foremost artwork, VNS was an ongoing umbrella project which informed subsequent interactive works. This was due to the “artificial perception system”425 created for VNS involving proprietary software being adapted for later works and extensive iterations of VNS.426 The following comments draw on my interactive experiences and observations of others’ interactions with the version at curator Kathy Cleland’s “responsive exhibition environment” at Mirror States in 2008427 (Figure 3-45) and an earlier iteration of VNS on permanent display at Technopolis in Belgium in 2006 (Figures 3-49, 3-50, 3-51, 3-52).

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422 Rokeby 1996.
423 Huhtamo 1998.
426 SoftVNS software is sold commercially, and has been used extensively in the field of interactive art, including by FoAM and Paine.
Chapter 3 – Case Studies: Context and Contextualisation

Figure 3.45: Photographs of participants in David Rokeby VNS (1983-2004)

Figure 3.46: Contrasting computer and video camera assessment of David Rokeby’s movements

Figure 3.47: Rokeby interacting with VNS installed in Potsdam, Germany in 1991

Figure 3.48: Rokeby’s illustration of the cybernetic cycle within VNS

Figures 3.49, 3.50, 3.51, 3.52: One version of VNS that I interacted with at Technopolis in Belgium in 2006. Showing the textual and graphical instructions for participants. Photography by Josh Wodak.
As a work initially inspired by Krueger’s *Videoplace*, like *Videoplace*, VNS used cybernetic cycles between artwork and participants’ behaviour (Figures 3-46, 3-48). However VNS also marks Rokeby’s departure from Krueger’s practice (while continuing to be influenced by his ideas), as VNS was based on sensing subtlety and nuances in participants’ behaviour in contrast to the surveillance of presence/absence that formed Krueger’s Interaction Design. In this sense Huhtamo argues VNS attained “distinctive features of” interactivity relative to *Videoplace* due to “the complexity and the fluidity of the interactions it makes possible”\(^\text{428}\) as it instantaneously “translated”\(^\text{429}\) human movements into sounds/music.

VNS was exemplary in evoking responsibility to quotidian environments by interacting via the cybernetic relationship at “the core of the work.” According to Rokeby this evocation of interpenetration between Inside-Outside occurred because interacting with “interfaces leave[s] imprints on our perceptual systems which we carry out into the world,” with this “effect” becoming “stronger” over the course of interaction. Indeed, in *Inside Outside*, his catalogue essay for *Mirror States*, Ross Gibson argues that VNS is outstanding among Rokeby’s ouvre, as it “encourage[s] an understanding of how you and the world are in and of each other, how you and the world are constituent of the other and mutually obliged.”\(^\text{430}\) Inside-Outside conflation was augmented by unconventionally installing VNS in “public outdoor spaces” as well as galleries and performance spaces\(^\text{431}\) (Figure 3-48). The “after-effects” of interacting with VNS were an experience that “strongly reinforces a sense of connection with the surrounding environment” which was the immediate physical environment the artwork was experienced in, followed by the residual effects of this experience “which we carry out into the world.” Referring to his desire to situate interactivity in art to “banal” everyday interactivity, Rokeby felt that when “walking down the street afterwards” he was “implicated in every

\(^{428}\) Huhtamo 2002.

\(^{429}\) Rokeby 1998.


action around me.” He also perceived participants’ heightened responsibility to quotidian environments following their engagement with VNS. Having observed “thousands of people” interacting with his work Rokeby found those who interacted with VNS for “15 minutes” or more “often feel an afterimage of the experience, [of] feeling directly involved in the random actions of the street.”

Unlike Paine, who used Rokeby’s software to allow participants “to play” and “command” his Ghost in the Machine installation like an “instrument,” Rokeby designed VNS as a means to “learn how to balance control” between participants and the “interactive system.” To achieve these desired “harmonics of the interaction” through “collaboration” between both parties, Rokeby sought to extend this balanced relationship between the Outside responsibility evoked during participants’ Inside responsibility. Based on his experiences with VNS, Huhtamo located this balance as stemming from both parties having roughly equitable influence over one another. However he does not see VNS as being “a model for utopian interactivity” but rather the deliberate outcome of Rokeby “making it often so difficult to tell who is controlling whom during the interaction.” This ‘equality’ expressed Rokeby’s critique of the ubiquity of “domination” in Interactive Art, due to the frequency with which he finds “interaction has come to mean ‘control.’” Consequently his work does not present “interactive technology for ‘empowerment,”’ as he finds this leads to “the illusion of power” that manifests “a fantasy of power bereft of responsibility.”

The way in which VNS produced “a complex and resonant relationship” between artwork and audience was such that “the lines

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432 Rokeby 1998.
433 Rokeby 1996.
437 Rokeby 1990.
438 Huhtamo 1998.
439 Rokeby 1995a:147.
440 Rokeby 2008.
between” them “become blurred.” This blurring was an argument against a dialogical relationship between both parties since “dialogue in its back-and-forthing implies a separation of the functions of perceiving and responding.” Instead the feedback loop in VNS was so tight that “perception and expression are virtually simultaneous.” In fact, he desired that both parties “interpenetrate, until the notion of control is lost and the relationship becomes encounter and involvement.” Huhtamo argues this was not to create a “cyborg” or “merger,” but rather to evoke a shared responsibility, as Rokeby declared that artwork and audience “collaboration” would be “broken when the interactor attempts to take control.” To encourage more responsible modes of engagement, Rokeby cautioned audiences that the “more intent one is on controlling my installation, the less predictable the response becomes.”

To understand how VNS evoked such responsibility to the physical environment, it is necessary to examine how its Interaction Design achieved such a delicate balance. This was partly achieved by reconciling the seemingly mutually exclusive properties of complexity and control, as VNS was an “attempt to draw as much of the universe’s complexity into the computer as possible.” While decrying that artists should “remain humble” to complexity “in designing environments for experience,” Rokeby compromised his “idealistic notions about what interaction meant (and how it would change the world)” due to the initial ‘trial-and-error’ iterations of VNS. These versions could not evoke his intended responsibility due to their imbalance between complexity and control. With participant’s every action influencing “as many parameters of the system’s behaviour as possible,” VNS became “interactive

442 Rokeby 1990.
443 Rokeby 2008.
444 Huhtamo 1998.
445 Rokeby 1996.
446 Rokeby 1985b.
448 Rokeby 1998.
449 Rokeby 1998.
on so many levels that the interaction became indigestible."\textsuperscript{450} Through iterative design, Rokeby produced more intuitive responsivity by limiting what and how participants influenced the sounds. He found this simplicity-complexity and authority-control trade-off “problematic” as participants “empowerment grew” from making it possible for them to “recognise their impact on the system immediately.”\textsuperscript{451} His ‘solution’ to this conundrum was the same as FoAM and Paine: to encourage participants to understand the “nuanced levels of interaction” via “repeated exposure,” which would allow them to increase their “expressive power”\textsuperscript{452} when interacting with VNS.

A Responsive Environment designed for multiple encounters has to also cater for first time and/or once-only participants managed via what Penny refers to as the “learning curve”\textsuperscript{453} of each participant. Huhtamo found his initial interaction with VNS, and observation of others, followed a “peculiar ‘rite of passage’”\textsuperscript{454} that Rokeby termed “the ‘First Test of Interactivity’”:

\begin{quote}
A person makes a gesture, as though asking a question of the space and notes the system’s response. They make a second gesture and a third, again as questions, and both times receive the same response as the first. At this point, they pause, a change comes over their face as if to say ‘Yes I understand I have control,’ and they make a fourth gesture, no longer as a question, but as a statement, almost a command. And they almost invariably get a different sound, the shift in attitude manifesting itself in a subtle but noticeable shift in the carriage of the body and of the instant-to-instant dynamics of the gesture.\textsuperscript{455}
\end{quote}

This creates a challenge for evoking participants’ responsibility through interacting, as at the other extreme, where participants “allow themselves to respond spontaneously to the music of the system,” Rokeby finds they become “played by the installation.” As the solution lies in participants’ responsibility for their behaviour (as influenced by interacting with VNS), Rokeby advocates a “combination” of the above two extremes, which in his “ideal...are balanced,

\begin{footnotes}
\textsuperscript{450} Rokeby 1998.
\textsuperscript{451} Rokeby 1998.
\textsuperscript{452} Rokeby 1998.
\textsuperscript{453} Penny 2000.
\textsuperscript{454} Huhtamo 1998.
\textsuperscript{455} Rokeby 1990.
\end{footnotes}
resulting in a ‘broad bandwidth’ of interaction” as participants oscillate between being ‘player’ and being ‘played.’

In rejecting dominant interactive modalities, Rokeby advocates that participants’ desire for such “proof” of “predictability” is suited only to “simple” interactive works “with no memory and no ability to adapt.” Like Penny and Armstrong, Rokeby also explores participants’ contributions to constructing complex interactivity by implicating “the complexity of sentient human response” into their interaction with his work. Rokeby reasons the indefinable control in the ‘First Test of Interactivity’ occurred due to “the complexity of the participants themselves” rather than “the complexity of the system” as VNS did not “interpret motivation” but instead “merely reflected what it saw.”

Nevertheless, engaging with such interactive artworks often focuses on ‘testing’ their interactivity. Like Rokeby, Penny finds this has “dire aesthetic consequences” for participant engagement with his work. When participants ‘test’ his artwork’s interactivity, Penny finds his artworks become “consumed by intellectual reverse engineering,” whereby participants conflate having “solved” the system of interactivity with engaging with the artwork in toto. Rokeby similarly discourages this “predominantly intellectual approach” that abhors “immediate participation in the feedback” as it constitutes an attempt to “learn to control the system in order to be able to play it like an instrument.”

Consequently, after VNS Rokeby’s core artworks used audience responsibility and interactivity differently, as they began to favour implicit over explicit audience interactivity. The two immediately succeeding artworks, Watch and SRC, relegated “direct audience interaction” to “a supporting role” in audiences’ overall encounter. Rokeby reasoned that audiences were largely

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456 Rokeby 1990.
457 Rokeby 1995b.
458 Rokeby 1996.
459 Rokeby 1995b.
461 Rokeby 1990.
“return[ed] to the role of passive observer” despite his awareness that others might declare this “a complete betrayal of the ‘interactive mandate.’”\textsuperscript{462} While continuing to explore “the mode and texture of interaction,” Rokeby reticently termed them “interactive” due to the above mentioned prevalence of audiences to then “verify”\textsuperscript{463} their interactivity.

However their interactive modalities purposefully explored ambiguity about audience responsibility. The Inside-Outside relationship was evoked by incorporating ever-growing databases of audiovisual recordings of quotidian environments, which the artwork processed to conflate past with present, documentation with abstraction and observer with observed. In \textit{Watch}, Rokeby embedded his “carefully designed hidden interactions” between these above states so they would be revealed if audiences would “spend extended quiet time in contemplation of the installation.”\textsuperscript{464} However contemplation was not passive: live video of persons outside made them “trigger a cybernetic system” as they could be “(potentially) ‘triggered’” by it, once audiences ascertained how they could ‘interact’ with \textit{Watch} if they too were recorded by the video cameras (Figures 3-53, 3-54, 3-55). As \textit{Watch} blended past and present, anyone recorded at any time could feature in this “cybernetic system,” albeit only those who first understood their role would be aware of this. Rokeby openly acknowledged the roles as “the observer/the observed” who were deprived of “a conscious interplay with a cybernetic system” were potentially “antithetical to interactivity.”\textsuperscript{465}

These ambiguities were at the forefront of \textit{SRC}, which explored similar themes to \textit{Watch}. An array of video cameras, amplifiers and loudspeakers were placed around the periphery of a room, where a video projection onto the floor combined pre-recorded past video, live video and live manipulations of both.\textsuperscript{466} Audiences were potentially incorporated into the content, by their body and/or

\textsuperscript{462} Rokeby 1996.\textsuperscript{463} Rokeby 1996.\textsuperscript{464} Rokeby in Simanowski 2003.\textsuperscript{465} Huhtamo 1998.\textsuperscript{466} This was influential in how Emergence conflated pre-recorded past video, live video and live manipulations as discussed on p264.
shadow over the projected area being filmed. Attendees became collectively responsible for SRC as a result of their behaviour, as each left “traces” of their encounter which would “affect the experience of the work for later visitors”\footnote{David Rokeby. ‘Silicon Remembers Carbon.’ David Rokeby’s Website. 2007. http://homepage.mac.com/davidrokeby/src.html. Accessed 25 March 2007.} by these resonant traces affecting the behaviour of the audiovisual media in future states of SRC.

SRC used deliberately obtuse ‘rules’ for responsivity to create “subtle” interactivity to the extent that it was “probably invisible to many audience members.” Rokeby found this implicitly encouraged more contemplative and absorbed relationships to SRC, while explicitly discouraging participants “performing to the image.”\footnote{Rokeby 1996.} Diminished responsibility for interacting was designed to give audiences the reflective space to explore Rokeby’s “ambiguous propositions” about their relationship to SRC, such as “Is that my shadow? Should I step into the image? Have I violated the artwork? Is this real?
Did I help create this?" Rokeby found "most interactors are left with the bewildering impression that there is a relationship between their actions and the system's reactions, but an opaque, impenetrable one." The next work, Giver of Names (GoN) is, like VNS, an umbrella project developed over years and successive iterations from 1990 until today when it is still “in progress,” the only one of Rokeby’s 28 artworks with no listed end date. The following discussion draws on my numerous encounters with GoN in Germany in 2006 and Australia in 2008 (Figures 3-56, 3-57, 3-58). GoN unconventionally uses audience interactivity with “System Interaction,” to explore what Sarah Cook argues is "a critique of machine-made artificial intelligence." Interactivity involves audiences placing an object (including their body) in front of a camera, which takes a photograph. The computational system analyses this photograph amidst an inexorably complex database of words, to produce a loose and opaque understanding of the object(s) in the photograph according to the computer's linguistic logic. My encounters were marked by frustration at my limited responsibility from what Ozog described as GoN's “trammeled” interactivity, as it returned distinctly different 'descriptions' to miniscule variations in re-positioning the same object for successive photos. This may have been due to my 'uninformed' encounter (as I deliberately read little about GoN before interacting with it), so I took to

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469 Rokeby 1996.
470 Huhtamo 1998.
475 Some examples of responses to putting just my hand in the 'photo-frame' from the installation in Germany: “the prominence will eye that taking eye painfully”; putting my middle finger up: “the depressing person in the centre blazons the previous point” and my face “a next cardinal will soon swarm with the 70 brain.”
comparing my encounters with those of Cook, Dot Tuer and Daubner Ernestine who have written critical analyses of GoN.

Rokeby declared the responsivity, as I experienced it, was deliberately “unpredictable” although it had to “never appear to be random” so as to encourage ongoing interest to ‘interact.’ Daubner Ernestine had such an experience, as he found “the computer screen continuously presented different arrangements of words and sentences,” leading to all his encounters being “different and unique.” In this vein, Cook situates GoN within the discourse surrounding “relational aesthetics” as it uses “the ‘discrete object’” (Figure 3-57) that such discourse neglects “and imbues it with the possibility of meaningful interaction.” The qualifier of “meaningful” rests in the eye of the

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477 Rokeby 1996.


beholder as Rokeby’s writings on GoN reveal his interest in the arbitrary
meaninglessness of language, especially as GoN espouses a critique of
artificial intelligence. Nevertheless, Cook uses her above statement to reason
that GoN “breaks down the distance between it and its audience, and in
breaking down that distance, suggests a new kind of subjectivity, one based
on reciprocity.”

As (n)chant (2001) (Figures 3-59, 3-60), Rokeby’s next major
interactive work, marks his definitive shift into System Interactives, it is beyond
the scope of this dissertation to discuss this work. Nevertheless, it offers a
compelling mode of responsivity and interactivity, albeit within “a system that
could be characterized as autonomous” as it is “based on the principle of
‘system interaction,’” which Huhtamo argues is “the opposite of user
interaction” as it “deliberately marginalizes the active participation of the user,
placing the machine and its operations in the centre.” While Rokeby’s
artworks since (n)chant have progressively involved less (or no) audience
interactivity, his early and middle career artworks possess such novel
explorations of responsivity and responsibility as to make his artworks the
most cited and influential in the ‘field.’

Figures 3-59, 3-60: Installation views of David Rokeby n-cha(n)t (2001)

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480 Cook 2007.
3.5 Case Study #4: Keith Armstrong and Transmute Collective

Whilst technology can be exclusionary the responsibility of the Ecosophical artist is to make technological work accessible to a broad public, developing interfaces that allow satisfying access to content and its means of generation.

Keith Armstrong

Keith Armstrong is an interdisciplinary artist and academic whose work draws on his training in Electrical Engineering, Information Technology and Visual Arts. His installations have been staged in Austria, England, Scotland, Greece, America, Canada, China and Australia since 1993. The following discussion focuses on the collaborative installations made for his PhD and Intimate Transactions (2006), the first interactive artwork following his PhD. All artworks were made with Transmute Collective, an Australian collective of interdisciplinary artists, technologists, activists and researchers formed in 1998. Discussion principally concerns Armstrong, as co-founder and Artistic Director of Transmute Collective, but also refers to the members of Transmute Collective who collaboratively created each artwork. The account of Armstrong’s trajectory is, like the above discussion of Rokeby, grounded in Armstrong’s theoretical citations quoted in the two previous chapters.

Armstrong’s art, research and writing reflect his “key concepts” of combining interactivity and responsibility in collaborative installations. His PBR over the course of his PhD underwent a similar “key shift” to Paine’s “journey towards true interactivity”: from non-interactive artworks that implicitly evoked environmental responsibility to explicitly addressing environmental responsibility through Artist-Artwork-Audience interaction. Through “iterative development” and “cyclical action and reflection” between each new

482 Armstrong 2002:36.
484 The principal other members of Transmute Collective are Lisa O’Neil and Guy Webster.
486 Armstrong (2002:44) writes that “the key shift in approach over the course of this study involved the removal of live performers from the work and an increasing emphasis on the complex dynamics of audience interaction within the artwork.” Of note is live performance based #14, the first of the three artworks he made for his PhD.
artwork, collaboration was extended from being between co-creators to encouraging participants to collaborate. To achieve this, Armstrong aimed to offer “interactive experiences that ask participants to reflect upon the implications of individual action and group collaboration within computational, aesthetic systems of which they become an integral part.”

Armstrong’s PhD ruminates over the trade-offs between creating implicitly dialogical engagement and aspiring to evoke environmental responsibility through explicitly dialogical interactivity. These trade-offs arise since his “ecosophical” artworks aspire toward the interactivity of “complex interchanges inherent within face to face conversations,” as such responsivity underpins the “complex sets of reciprocal interchanges that draw focus around networks of reciprocal connections” between humans and their environment. Armstrong’s context-appropriate responsibility is a “stewardship” between Artist-Artwork-Audience that aims to facilitate “reciprocity amongst all parties” through his vantage point of ‘in-betweenness.’ Given this is “epitomised within Intimate Transactions,” the following discusses the development of this stance.

As Armstrong relegates Transit Lounge (2001), one of the three works made for his PhD, to a figurative ‘stepping stone’ toward Intimate Transactions, it is useful to compare both works. Transit Lounge was an “adaptive multimedia space” that presented “evolving performative narratives based upon changing environmental conditions.” In contrast to Armstrong’s other artworks, and the other artworks in this chapter, it was avowedly narrative based, with human characters and multifarious narrative pathways.

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494 Armstrong 2002:244.
that behaved according to combinations of participants’ interactions and “environmental parameters beyond their immediate control”\textsuperscript{496} such as exterior weather conditions.\textsuperscript{497} However the illusory control and interactivity (such as what participants were responsible for relative to the influence of external weather conditions) were not self-reflexive. This arose since the “partially hermetic system” that undermined his desired “system of exchanges” between Artist-Artwork-Audience “functioned essentially outside of the processes of flow and exchange represented by the internal operating mechanisms.”\textsuperscript{498} 

Transit Lounge problematically fulfilled Armstrong’s ethos to eschew “any definite sense of command and control or predictability of response”\textsuperscript{499} as it behaved “regardless of any responsibility” of participants’ interaction, which contravened his “Ecosophical approach.”\textsuperscript{500} Participants were unable to exercise responsible behaviour to the physical environment of the artwork as the influence they exerted relative to the influences from the natural environment that were beyond their control or responsibility were not made apparent.

Following from his PhD conclusion about “Interface Design Strategies” in light of the artworks made for his PhD, Armstrong summarised the techniques to be explored in Intimate Transactions. This work hinged on a “fine balance” between “degrees of control” affording a “level of predictability [that] allows interactors to connect similar actions with responses.” In conjunction, responsibility derived from a “permeable membrane” between Artist-Artwork-Audience, which hinged on proportionally balancing “bi-directional” passages ‘through’ this membrane. In this scenario environmental responsibility was evoked by audiences being “set within the work’s ecology,”\textsuperscript{501} which, by Armstrong’s description, owes much to Rokeby’s articulation of his similar balancing act between Artist-Artwork-Audience on

\textsuperscript{496} Armstrong 2003:93.

\textsuperscript{497} Although the other artists in this chapter have used such ‘random’ determinants in their work, Transit Lounge conjoined these influences, that participants could implicitly be responsible for, with those stemming from participants real-time behaviour with the installation.

\textsuperscript{498} Armstrong 2002:265.

\textsuperscript{499} Armstrong 2002:34.

\textsuperscript{500} Armstrong 2002:266.

\textsuperscript{501} Armstrong 2002:266.
To increase audience responsibility, these permeable membranes would become “permeable boundaries” between Artist-Artwork-Audience so “audiences might co-opt the artistic direction of the work and make it their own.” While Armstrong does not conflate artwork with audience, this technique had the “aim of breaking down the separation between audiences and artworks.” He follows this statement regarding Transit Lounge, by declaring that his “stewardship” was, “by the end” of the production process, “the work’s manager.” However authorship and responsibility rested largely with the ‘makers,’ even if in the ‘delivery’ his role was as Graham’s figurative dinner host. This desire of such artists to partially relinquish authorial responsibility to audiences is noted in Edwina Bartleme’s review of Transit Lounge which categorises Armstrong as “‘originator’” and participants as ‘completers.’

Intimate Transactions is a Responsive Environment between two rooms that can be in the same or different buildings or even different cities. Both rooms are identically arranged: both participants stand, facing a video projection screen (Figures 3-61, 3-62) on which they direct their avatar (Figures 3-63, 3-64) through ‘virtual worlds’ symbolising different ecological zones. Both participants engage in “dialogic frameworks of interaction and cooperation” as they negotiate where to go and what to do, by controlling their avatar through moving their body on a large interface called BodyShelf (Figures 3-61, 3-62).

Intimate Transactions featured a similar process to FoAM’s trg (2006), with sessions at set booking times and limited numbers, involving pre-immersion ritualistic preparation for the session and a debrief before leaving the artwork. Each 30 minute session was booked in advance, Intimate Transactions being experienced over this fixed duration with another

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502 Regarding Rokeby, Armstrong writes (2002:73): “at the commencement of this study, his words offered an important insight into the type of interactivity that the Ecosophical practitioner might pursue.”

503 Armstrong 2002:52.

504 Armstrong 2002:44.


506 Armstrong 2002:44. Emphasis added.

507 See p55.


live participant present for the same duration. Participants were chaperoned into and out of the installation and literally strapped into *BodyShelf*,\(^{510}\) as its haptic feedback required fitting for each body size so that the vibrating

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\(^{510}\) This was highly influential on my design of the costume for participants in *Emergence*. See p326.
chamber would sit approximately over each participants’ belly button. After each session, both participants saw live video of the heretofore unseen conversant for about one minute. Hand gestures and body language were used to communicate about the ‘success’ or otherwise of their interaction with one another and the artwork.

As *Intimate Transactions* was highly relevant to my work on *Emergence*, I arranged for the Producer and Director of *Emergence* to attend a session in Sydney in 2006. My two sessions and lengthy discussions with Armstrong and his collaborators about *Intimate Transactions* highlighted the rhetoric-reality discrepancy between what artists write about their work and what the work ‘says’ itself, and the crucial role played by the audience in creating this discrepancy, as I likely brought an excessive and ‘over-informed’ expectation to the work. As well as Armstrong’s academic writing on *Intimate Transactions*, his publicity made clear the explicit environmentalist concerns to those who booked in for a session with the installation (Figure 3-65).

My first session was baffling as to what I was ‘meant’ to do to interface with the work. While I better appreciated the work during a second session the following day, I didn’t perceive an evocation of responsibility to either the physical environment of the artwork or the natural environment the artwork referred to. I felt I was in a hi-tech computer game orientated toward pummeling the ‘natural’ resources of the ‘virtual’ worlds, with the restrictions being my conscience and that of my anonymous co-participant. I felt responsibility to the social environment via my constant negotiations with my co-participant, after which we directly acknowledged our behaviour to one another in both concluding live video components. Despite key difficulties in evoking responsibility toward the physical environment of the artwork, it highlighted similarities with Graham’s evocation of social responsibility through encouraging interaction between co-participants in her *Individual*

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511 This appeared to be similar to Liz Baker’s experience. She writes that “when observing others, I realised two things: how much of the experience I missed because I was focusing too much on what the experience was ‘supposed’ to mean; and that the installation experience did not necessarily link back to the underlying concepts the performers/creators explored.” Keith Armstrong. ‘Interview with Liz Baker.’ 2007. http://embodiedmedia.com/projects/intimate_t/bakerconv.htm. Accessed 14 October 2008.
Fancies. Evoking responsibility toward the natural environment referred to by the artwork was hindered by Armstrong not being able to implement his intended iteration that behaved according to cumulative consequences of successive participants’ interactions. While these features would have significantly increased participants' real-time and cumulative responsibilities they were not implemented due to the co-creators’ anticipation that participants would not understand their individual responsibility amidst such collective influences. These notions and their problematic realisation were highly influential to my work on Emergence and are discussed in depth in Chapter 6.

3.6 Case Study #5: FoAM

While FoAM and Transmute Collective are both interdisciplinary, intermedia collectives of artists, researchers and computer scientists exploring responsibility through their artworks, FoAM exemplifies the properties unique to Responsive Environments among contemporary collectives. They describe themselves as a transdisciplinary laboratory committed to growing inclusive, resilient and abundant worlds. FoAM seeks out and connects people in the interstitial spaces between professional and cultural boundaries. They mix realities of art and science, digital and physical, food and media, gaming and gardening. With it's motto ‘grow your own worlds', FoAM encourages its collaborators and audiences to move from wasteful consumption to responsible participation in all aspects of their lives.

The collective was formed in 2000, comprising members from Belgium, Holland, Australia, Croatia and Lithuania and has since staged installations in Belgium, Croatia, Austria, Germany, Italy, England, Slovenia, Canada and

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512 See p268.  
513 See p282.  
America. After discovering them through my online survey,\textsuperscript{515} I met Nik Gaffney and Maya Kuzmanovic, two of the co-founders, at their talk at Canberra University in 2006.\textsuperscript{516} Subsequent email exchanges of ideas about our respective practices culminated in my spending a week at their Brussels headquarters in 2006. I had not experienced their artwork \textit{in situ}, so interviewing the core members and researching their audiovisual archive was instrumental in furthering my understanding of their practice. The following focuses on their works \textit{Tgarden} (2000), \textit{groWorld} (2001-), \textit{txOom} (2002) and \textit{trg} (2006), in light of the reflections from Kuzmanovic and Gaffney, who publish scholarly articles about their practice.

Their Responsive Environments generally involve large immersive spaces (up to medium sized warehouse) where co-participants interact with sonic, visual, haptic, tactile and architectural properties (Figures 3-66, 3-67, 3-68, 3-69, 3-70). Under the heading “Transformation and Responsivity,” they detail their techniques of creating “technologically enhanced spaces, which facilitate playful explorations of physical and digital surroundings as well as fluid dialogues between people, materials and media.”\textsuperscript{517} By engineering physical environments as “‘irreal responsive worlds’”\textsuperscript{518} they explore relationships between co-participants and their immediate environment to “raise participants’ awareness of their effect on the surroundings.”\textsuperscript{519} However they reject Virtual Reality or Augmented Reality approaches in favour of evoking participant responsibility to the social and physical environment, such as \textit{txoom} (Figures 3-71, 3-72), where participants clicking a mouse on a computer screen inside the installation caused crystal glasses to shatter in a neighbouring room within the installation, while participants were not informed that this would be the consequence of them clicking the mouse, other than the distant sound of glass breaking after each click.

\textsuperscript{515} This survey is discussed on p56. The names of the other core members are Cynthia Bohner-Vloet, Maja Ozan Cakmakci, Steven Pickles, Cocky Eek, Joel Ryan and Laura Farabough.

\textsuperscript{516} Maya Kuzmanovic and Nik Gaffney. ‘Foundation for Affordable Mysticism.’ Presentation at Canberra University, Canberra, March 8 2006.

\textsuperscript{517} Kuzmanovic and Gaffney 2006:1.

\textsuperscript{518} Kuzmanovic and Gaffney 2006:1. Their neologism “irreal” refers to the constructed and ‘non-real’ or ‘un-real’ nature of their Responsive Environments as “responsive worlds.”

\textsuperscript{519} Kuzmanovic and Gaffney 2005:13.

3-41 shows the ritualistic preparation for participants prior to the entry, with a remedial massage.


Figures 3-73, 3-74: Installation views of FoAM groWorld (2001-).
To evoke participants’ responsibility through such means, FoAM use three pivotal interrelated and interdependent criteria. The first is through non-metaphorical “conversational interaction” between Artist-Artwork-Audience. The “fluid dialogues” mentioned above partly arise from the “range and subtleties of human gestures and interactions” that influence their sensing systems. This derives from their influence by, but departure from, Krueger’s surveillance based presence/absence detection, in favour of artificial perception systems that monitor nuance and subtlety in participant’s moment-by-moment behavior in “continuous (time-based data streams).” This Interaction Design harnesses “continuous and unpredictable” responsivity which they combine with systematic modeling of Alife processes to invoke evolution and adaptation over each staging. FoAM refer to their works as “entities” which “behave” as if they were “aware of their own presence and that of the people interacting with them” such that ultimately they “should begin to enter into a dialogue (collogue)” with participants. In T-Garden this was evoked through dialogical exchange between participants, who influenced “the density of the visual environment while varying the melodic and rhythmic aspects of the sound space” so they “leave traces and ‘converse’ with each other in musical and visual phrases as they weave their way through the room” (Figures 3-73, 3-74).

The second criteria stems from using biomimesis to evoke natural environments in their works. In txoom, their “principles of Biomimetics” defined their design ethos according to “biological forms and processes,

520 Kuzmanovic and Gaffney 2005:8.
particularly emergent phenomena.” This ideal hinged on using emergent phenomena to create “a free form, spontaneous space with a consistent aesthetic, yet indeterminate evolution, that people from a range of cultures, ages and backgrounds can experience.” Under their GroWorld initiative, their suite of artworks exploring “evolution and interaction of dynamic systems,” they outline such principles in a pseudo-manifesto:

As an artistic concept, growth is opposed to the notions of artworks as finished products, that can be exhibited and sold for aesthetic enjoyment. Growth implies an element of wilderness, of the untamed and the uncontrollable, of a continuous process responsive to the conditions of its surroundings.

The third criterion concerns distributing authorial responsibility between artist and audience. This arises from the above criteria, as FoAM’s interaction modalities involve raising audience responsibility toward “influence and control, intentionality and co-creation.” Like Armstrong, they distribute such responsibility chronologically, whereby their “significant influence on the initial forms” of each artwork is superseded by the end-realisation ‘evolving’ into open ended processes of “surprise and spontaneity” that transcend their initial control. They use this approach to move “away from producing immutable objects toward becoming dynamic, fluid worlds” wherein attendees shift “from observation to participation.” Accordingly, this requires participants’ “responsibility, communication, as well as the understanding of people’s mutual influence on each other and their surroundings.”

However reality remains within the ephemera of participant engagement. FoAM acknowledge the transient nature of these roles, wherein

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529 Kuzmanovic 2001a.
530 Kuzmanovic and Gaffney 2008:1.
531 Kuzmanovic and Gaffney 2006:2.
532 Kuzmanovic and Gaffney 2006:2.
533 Kuzmanovic and Gaffney 2006:5.
“performance dissolves the lines between performer and spectator by creating a social, computational and media architecture that allows the visitor-players to sculpt and shape the overall environment.”534 Whilst the performance may appear to dissolve these lines, the artwork exists beyond the performance alone, where the ephemeral engagement between players-as-visitors and the visitors-as-players highlights their impermanent sculpting of the Responsive Environment. Nevertheless, their negotiations between the rigid and the fluid is highly illuminating with regard to how the real may aspire to the irreal535 over the oeuvre of their practice.

### 3.7 Summary

The above accounts of these artists’ career trajectories demonstrate alternative strategies toward ‘solving’ challenges inherent to evoking environmental responsibility in Responsive Environments. Rather than posit a definitive ‘solution’ through any one artwork, artist or artform, their career trajectories demonstrate “a journey towards true interactivity,”536 with the ‘truth’ lying in combining intuitive, counter-intuitive, satirical, “‘broad bandwidth’”537 or trammeled interactivity in their composed compositions of content, form and Interaction Design. The case studies portray how each artist/collective developed context- and content-appropriate approaches to negotiating between rigidity and fluidity, real and irreal, Inside and Outside, biological and human spatio-temporal scales to “inspire more responsive (and perhaps responsible) forms of design, engineering and social organisation.”538

Their writing, combined with their artworks, demonstrate attempts to balance the binaries of authority-control, determinacy-indeterminacy,

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535 “Irreal” is used in the context defined by FoAM (Kuzmanovic and Gaffney 2006:3), where it refers to the purposefully designed and engineered nature of Responsive Environments, in distinction to the designer-less and non-engineered nature of natural physical environments. However, in line with FoAM, the term ‘irreal’ may relate to Mixed Reality or Augment Reality but does not refer to Virtual Reality.
537 Rokeby 1990.
simplicity-complexity, narrativity-interactivity and responsivity-responsibility. Within these attempts and their divergent combinations of content, form and Interaction Design are shared desires to maximise complexity and interactivity, while reducing their authorial authority (and associated responsibility) and increasing audiences' authority (and associated responsibility). The tensions between what responsibility their artworks evoke, versus what they desire their artworks to evoke, arises from the intractable rhetoric-reality disjuncture between ideal and real realms of Alife aspiring “art-as-it-could-be”\textsuperscript{539} and art-as-it-actually-is as Blife art.

These same tensions run through the myriad ways my PBR is influenced by these artists, as each artist/collective illuminated different aspects of my rationale for my own combinations of content, form and Interaction Design. Armstrong’s earlier artworks, such as #14, were “performactives,”\textsuperscript{540} hybrid performance-installations where Transmute Collective interacted with attendees through complex technology. This was highly influential on my approach of retaining human agents within the installation environment of StilmS\textsuperscript{541} and Emergence.\textsuperscript{542} Participants’ embodied engagement through wearing a harness in Transmute Collective’s Intimate Transactions was highly relevant to my Interaction Design for Emergence v3, which included a theatrical costume for participants to interface them with the physical environment of the artwork through haptic and tactile sensations emitted via the costume. Similarly, StilmS and Emergence drew on chaperoning audiences, as used by Transmute Collective and FoAM, wherein participants are ritualistically prepared before their encounter with the work at specified times for a pre-determined duration and then ‘debriefed’ before they return to the Outside environment.

Balancing between the complexity of interactivity and appropriate numbers of co-participants for Kali Yuga, StilmS and Emergence was informed by the approaches taken by Intimate Transactions, FoAM and Paine in this pursuit. Similarly, McCormack’s progression from one-to-many interactivity in

\textsuperscript{539} McCormack 2005a.

\textsuperscript{540} Of his work, #14 can be seen as representative of his “performactives.” Armstrong 2002:71.

\textsuperscript{541} See p215.

\textsuperscript{542} See p260.
Turbulence to the many-to-many interactivity in Eden was a decisive influence on my similar progression from the one-to-many interactivity in KYv2 to the many-to-many interactivity in Emergence. Creating conditions conducive to evoking responsibility by relating the interaction modality to the number of co-participants demonstrates just one among many interrelated approaches, which, on balance, constitute cohesive strategies for evoking environmental responsibility in Responsive Environments. The next three chapters demonstrate in more depth how my own approaches similarly embrace diverse modalities in the attempt to balance contending considerations in creating Responsive Environments.