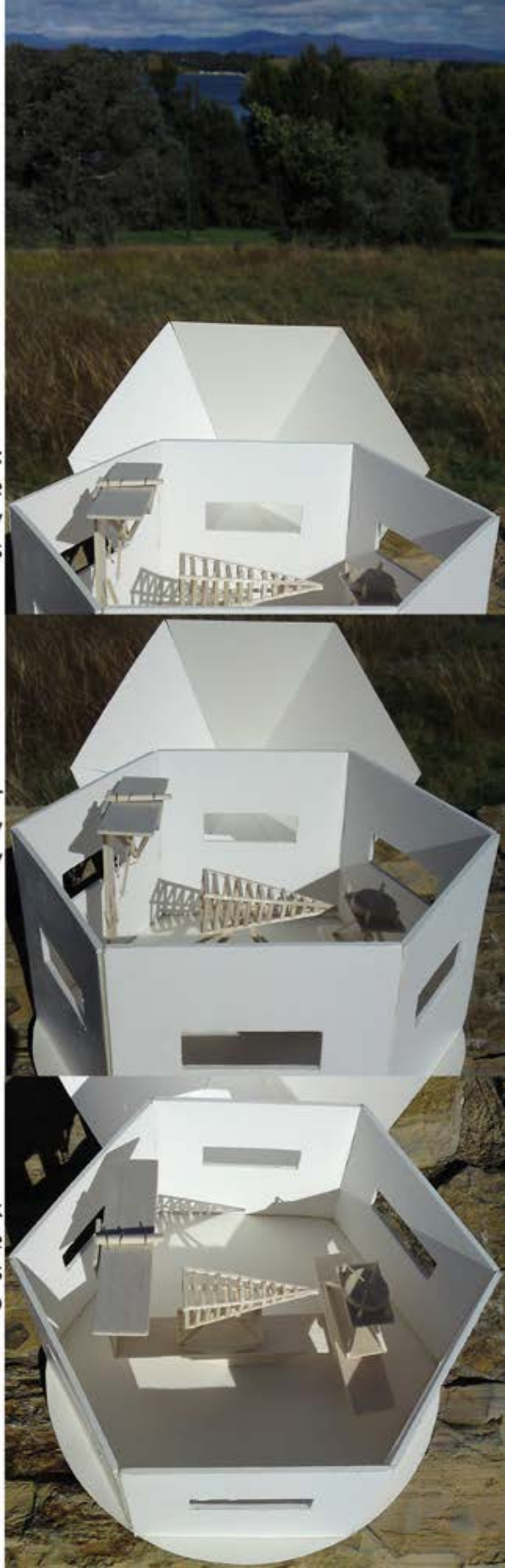Interrogating Interactive Interfaces:
On balance
in the evocation of environmental responsibility
in the creation of Responsive Environments

A thesis submitted for
the degree of Doctor of Philosophy
of The Australian National University

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June 2010

Chapter 2: State of the Art

2.1 Introduction

> The problem is…most successful communication involves a great deal of craftsmanship and authorship and point of view and storytelling and narrative… Interaction largely destroys all that. By giving the audience control over the raw material you give them precisely what they don't want. They don't want a load of bricks, they want a finished construction, a built house.
>
> Max Whitby[134]

This chapter explores the State of the Art of Responsive Environments and their challenges for evoking environmental responsibility. It is structured

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[134] Max Whitby in Andrew Cameron. 'Dissimulations: Illusions of Interactivity.' *Millennium Film Journal* Volume 28:42. 1995. http://mfj-online.org/journalpages/mfj28/dissimulations.html. Accessed March 12 2006.

by disaggregating issues arising from creating Responsive Environments into relevant components, to partially separate their discussion. As this chapter discusses the issues ingredient-by-ingredient, the components are collectively explored artist-by-artist in the case studies in Chapter 3. The Inside-Outside relationship - whereby participants' responsibility to the social and/or physical environment-of-the-artwork may evoke responsibility toward natural and/or quotidian environments - forms the organisational principle for the two halves (Sections 2.2 and 2.3) of this chapter. Section 2.2 constructs an 'external' analysis of the State of the Art via broader art historical and cultural frameworks within which Responsive Environments exist. That is, how they are received and understood by theorists and practitioner-theorists. This responds to the deficit in understanding Responsive Environments due to the scant discourse about what their ingredients are and the issues in combining them with one another.[135] Section 2.3 constructs an 'internal' analysis of practitioner-theorists' attempts to balance ingredients within and between one another to create Responsive Environments. The membrane between Outside (2.2) and Inside (2.3) is permeable, as the issues in each section intersect with one another in artists' attempted 'solutions' to intractable impediments to evoking responsibility in Responsive Environments.

Such 'solutions' harness algorithms as recipes for creating Interactive Art.[136] Algorithms can be usefully understood allegorically as recipes for complex problem 'solving,' which for this thesis denote recipes for combining the three ingredients and four binaries to create Responsive Environments that evoke environmental responsibility. Each recipe may target select challenges, as no single recipe may 'solve' the myriad of mutually exclusive considerations that are negotiated to create Responsive Environments. The writings of the artists cited in this thesis lay bare their algorithmic recipes and choice of ingredients, which assist in providing 'solutions' through sharing their strategies for creating Responsive Environments. Creation is commonly approached via analogies with designing/inhabiting dwellings (as illustrated in Whitby's quotation above) and cooking/eating food, which is central to

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[135] As discussed on p49 in the last chapter.

[136] As well as in related artforms such as Generative Art. Food was literally used as a generative agent in my artwork *D#generative* discussed on p174.

Graham, Armstrong and *FoAM*.[137] This thesis similarly approaches Responsive Environments via allegories and analogies, in parallel with Katherine Hayles literary criticism approach to *Narratives of Artificial Life.* Due to the "complexity" of Alife art+science, she reasons they are "best approached through indirection, by looking not only at the scientific content of the programs but also at the stories told about and through them."[138] This thesis analyses the complexity of Responsive Environments by a similar "indirection": their techno-scientific tools of creation, alongside their "stories," which are told through their recipes and ingredients. The remainder of this introduction illustrates the usefulness of allegories and analogies in reference to Whitby's above quotation, which succinctly encapsulates some of the central challenges to evoking responsibility in Responsive Environments.

To describe participant responsibility in *Individual Fancies*, her PhD artwork, Graham directly refers to Whitby's above quotation. Her "interactive teatable"[139] *Individual Fancies* (Figures 2-6, 2-7) allegorically engaged participants in "at least a semi-complete house rather than a shell,"[140] with lesser participant responsibility required due to the relatively simple and narratorial form of a rigid "semi-complete house." Graham applied this strategy to facilitate engagement through such intuitive and immediate responsivity, as opposed to greater responsivity and responsibility amidst the more fluid and malleable form of a "shell." Accordingly, the form and behaviour of *Individual Fancies* were somewhat pre-authored and pre-determined, to further facilitate intuitive interactivity amidst the "semi-complete house." While Graham advocates a balance between the extremes of a completed house and an

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[137] *FoAM's* strategies for engaging audiences incorporate the preparation of food, from communal seeding to gardening to cooking to eating, as figurative recipes for creating their Responsive Environments. *FoAM* write about these processes in *Open Kitchen* (http://fo.am/open_kitchen and http://fo.am/feedingwell), *Molecular Gastronomy* (http://libarynth.org/molecular_gastronomy) and provide a guide to restaurants in the regions of their headquarters and partner organisations (http://libarynth.org/restaurant_guide). Accessed 16 March 2010.

[138] Katherine Hayles. 'Narratives of Artificial Life.' In *Futurenatural: Nature, Science, Culture*, edited by George Robertson et al. London: Routledge. 1996:146.

[139] Beryl Graham. '*Individual Fancies* Program Notes.' *Beryl Graham's Website*. 1999. http://stare.com/beryl/cv/sub/fancies.htm. Accessed 16 March 2008.

[140] Graham 1997:108.

Figures 2-6, 2-7: Installation views of Beryl Graham *Individual Fancies* (1997)

empty shell, Whitby argues for pre-authored and pre-determined structures, wherein their "construction" as houses is "finished," as interaction "destroys" the "craftsmanship" of the authors. This extreme impedes the evocation of participant responsibility as it confines participants to the minimal responsibility arising from minimal 'interactivity' possible with a "finished construction."[141] The other extreme, of presenting participants with "a load of bricks," concludes the first half of this chapter, as it first traverses the ground in-between these extremes.

Whitby's quote is taken from Andrew Cameron's 1995 article, *Dissimulations: Illusions of Interactivity*, written at a time when Huhtamo's "old school"[142] was commanding respect for the unique issues its members explored through Interactive Art. Cameron railed against the euphoric rhetoric surrounding interactivity in art which preceded the disillusionment when Interactive Art 'failed' to achieve its emancipatory ends. Cameron and Huhtamo argued for the potential of interactivity in electronic art, by using Huhtamo's "media archeology"[143] to reveal what Interactive Art dissimulates in light of its archeological pre-history. In-depth discussion of the "archeology of

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[141] Whitby in Cameron 1995:42.

[142] The 'members' Huhtamo cites as producing "'classics' of interactive art" are Lynn Hershman, Jeffrey Shaw, Myron Krueger, David Rokeby, Ken Feingold, Agnes Hegedues, Grahame Weinbren, Luc Courchesne, Christa Sommerer, Laurent Mignonneau, Michael Naimark, Perry Hoberman, Paul Sermon, Toshio Iwai, Paul DeMarinis and Rafael Lozano-Hemmer. Huhtamo 2004:40.

[143] Erkki Huhtamo. 'Resurrecting the Technological Past: An Introduction to the Archaeology of Media Art.' *InterCommunication* Volume 14. 1995. www.ntticc.or.jp/pub/ic_mag/ic014/contents_e.html. Accessed March 12 2006.

interactivity"[144] is undertaken through the case studies in the following chapter, as the sections below consider the historical-through-to-contemporary State of the Art of Responsive Environments. These sections situate Responsive Environments in relation to debates about the potential of interactivity in electronic art, by way of select canonical works from Huhtamo's 'old school' and subsequent critiques of contemporary Interactive Art. The central issues are identified and clarified according to their order in the thesis title and research question, beginning with the state of betweenness that interconnects such disparate elements.

2.2 The Ingredients/a.k.a Recipes for Reciprocity

2.2.1 Betweenness

Interrogating interactive interfaces denotes pivotal processes by which Responsive Environments explore relations between entities, being in-between and betweenness itself. However, betweenness and hybridity are obstacles to understanding as they represent interstices that have not yet been defined as terms or core qualities. Betweenness has been recognised internationally as a core quality of Interactive Art since around 1990 when interdisciplinarity and hybridity were recognised as being integral to such art. In Australia, this culminated in the Australia Council for the Arts controversial replacement of their New Media Arts Board in 2005 with two alternate categories: 'Inter-Arts' and 'Hybrid Arts.'[145] The same terms are highlighted in the four international benchmarks for displaying, facilitating and critiquing Interactive Art: the International Symposium of Electronic Art (ISEA); Ars Electronica (AE) in Austria; ZKM Centre for Art+Media in Germany; and ICC in Japan, which is termed an

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[144] Erkki Huhtamo. 'NeMe: Shaken Hands with Statues.' In *Broad Art Centre Exhibition Catalogue,* Los Angeles: UCLA Press. 2006. www.neme.org/main/ 662/shaken-hands-with-statues. Accessed September 5 2008.

[145] Two pertinent critiques of this are Keith Gallasch, *Art in a Cold Climate: Rethinking the Australia Council.* Sydney: Currency House, 2005, and Jennifer Craik, *Re-Visioning Arts and Cultural Policy: Current Impasses and Future Directions.* Canberra: ANU E Press. 2007. http://epress.anu.edu.au/anzsog/revisioning/mobile_devices/index.html. Accessed September 5 2008.

'Intercommunications Centre' rather than a 'Communications Centre.' In 2006, when I did fieldwork, the festivals titles of ISEA and AE were respectively *7 Days of Art and Interconnectivity* (Figure 2-8) and *Simplicity: The Art of Complexity* (Figure 2-9), with AE 2005 being *Hybrid: Living in Paradox* (Figure 2-10).

Figure 2-8: The flyer for *ISEA 2006*

Figure 2-9: The flyer for *AE Festival 2006*

Figure 2-10: The flyer for *AE Festival 2005*

These festivals and symposia reveal a major shift in approaches to using interactivity in art between 1990-2008: from optimism surrounding the necessity of 'inter-ness,' when Krueger's *Videoplace* (1974-1984) won the inaugural AE 'Interactive Art' prize in 1990, to increasingly negative reactions in the last decade by central practitioners and theorists against what these dominant benchmarks, particularly AE, consider Interactive Art to be. These negative reactions stemmed from the growing tendency in the intervening years to consider non-interactive artworks as 'Interactive Art.' This is particularly relevant for the artforms addressed in this thesis, as the vast

majority of the artworks cited in this thesis have won or placed very high in the annual AE festival.[146] To account for the extent of this shift, a compendium of AE judges provided a retrospective of their changed stances toward 'Interactive Art' between 1990-2004, by which time works without any audience interactivity were (and are still) winning the 'Interactive Art' prize.[147] The judges reasoned that such work

> makes manifest our expanded definition of interactivity and criteria in that the
> reception and contemplation of this work does not require the active audience
> participation that was so crucial in the early stages of the development of the
> genre.[148]

Huhtamo argues AE's stance has global ramifications, as AE is widely regarded as the most important exponent of Interactive Art.[149] In 2007 AE introduced the new category of 'Hybrid Arts' in addition to 'Interactive Art.'[150] This led the nearby Ludwig Boltzmann Media.Art.Research Institute to analyse all 350 entries to AE 2007 to "better identity suitable descriptive models for interactive art" due to their perceived difficulties in defining "specific categories of

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[146] Artists discussed in this dissertation who have won or been placed in the Interactive Art category include: Myron Krueger (1990), David Rokeby (1991), Bill Seaman (1992), Christa Sommerer and Laurent Mignonneau (1994), Bill Seaman (1995), David Rokeby (2002) and Keith Armstrong/The Transmute Collective (2005) and those of peripheral relevance include: *Cinematrix* (1994), Luc Courchesne (1999), Rafael Lozano-Hemmer (2000), *Blast Theory* and *Mixed Reality Lab* (2003), Ben Rubin and Mark Hansen (2004) and Paul DeMarinis (2006). Eduardo Kac won the inaugural category of Hybrid Art in 2009.

[147] This particularly refers to the works that won the prize for 'Interactive Art' in 2004 (Ben Rubin and Mark Hansen), 2005 (Esther Polak and Ieva Auzina), 2006 (Paul DeMarinis) and 2008 (Julius von Bismarck).

[148] 'Rearview Mirror: 1990-2004.' In *Cyberarts 2004*, edited by Hannes Leopoldseder, Christine Schöpf and Gerfried Stocker. Ostfildern-Ruit: Hatje-Cantz. 2004:110. Cited in Huhtamo 2004:4.

[149] The scope of the influence of AE is the subject of Timothy Druckrey's *Ars Electronica Facing the Future: A Survey of Two Decades*. Massachusetts: MIT Press. 1999.

[150] AE's descriptions of these two categories are: "Interactive Art…is open to all types of current interactive works in any form: installations, performance, audience participation, virtual reality, multimedia, telecommunication, etc. Criteria for judging the works include the form of interaction, interface design, new applications, technical innovations, originality and the significant role of the computer for the interaction" and "the 'Hybrid Art' category is dedicated specifically to today's hybrid and transdisciplinary projects and approaches to media art. Primary emphasis is on the process of fusing different media and genres into new forms of artistic expression as well as the act of transcending the boundaries between art and research, art and social/political activism, art and pop culture." http://90.146.8.18/en/archives/prix_archive/prix_kategorien_uebersicht.asp. Accessed 20 April 2010.

interaction"[151] in the history of AE. To explicate "categories of interaction" that apply to Responsive Environments, the following section outlines the 'inter-ness' that remains central to Responsive Environments, in spite of the dominant shifts that have undermined the 'inter-ness' of contemporary Interactive Art. The "categories of interaction" are established by outlining the relationship between the following three keywords, which inform the practice of those artists who are similarly at odds with dominant approaches to Interactive Art.

2.2.2 Interrogating Interactive Interfaces

'Interactive' is defined in two different contexts as two or more things which are "reciprocally active" as they are "acting upon or influencing each other" and in Human Computer Interaction as an "electronic device that allows a two-way flow of information between it and a user, responding immediately to the latter's input."[152] Co-dependency between interactivity and interrogation is evident in the Human Computer Interaction underpinning Responsive Environments, where interrogation involves "transmit[ing] a request for information to a device or program with the expectation that an immediate response will trigger further interaction."[153]

Outside of these Human-Machine and Human-Computer contexts, discrepancies exist with what interactivity denotes in Human-Human and Human-Environment approaches to interaction in art, media and science. In all these contexts, the term has become increasingly nebulous as an ill-defined

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[151] Kwastek 2008:23.

[152] *Oxford English Dictionary* (Second Edition) s.v. 'Interactive.' http://dictionary.oed.com/cgi/entry/50118746. Accessed September 5 2008.

[153] Taken from the dictionary on my laptop used to write this thesis and make much of the art for this PhD: *New Oxford American Dictionary*, Mac OS10.5, s.v. 'Interrogate.' Interrogate is also defined in this context in the *Oxford English Dictionary* as "to cause (a computer memory or memory element) to give a signal that corresponds to or reveals information contained in it." *Oxford English Dictionary* (Second Edition) s.v. 'Interrogate.' http://dictionary.oed.com/cgi/entry/50119621?query_type=word&queryword=interrogate&first=1& max_to_show =10&sort_type=alpha&search_id=CBvd-KIik9v-930&result_place=1. Accessed 20 April 2010.

hallmark of electronic art in popular vernacular.[154] The still-frame below from the TV cartoon *Futurama* (2005) parodies the current ubiquity of meaningless interactivity (Figure 2-13). Each episode in *Futurama* begins with a mock caption below the title. In this instance, the caption advertises that *Futurama* is "NOW INTERACTIVE!" (which seasoned viewers know is a joke) since "JOYSTICK CONTROLS FRY'S LEFT EAR." An ear can barely be moved, let alone controlled, while controlling only one mocks the tokenistic control now equated with 'interactivity.' Furthermore, which ear is 'left' depends on where *Fry* stands relative to Screen Left and Viewers' Left. This alternation between which ear is actually the 'left' ear creates confusion for the millions of viewers who might think they can influence this ambiguous ear.

     With such variance in applying interactivity in Interactive Art (let alone in sociological and scientific approaches to interactivity) key practitioners, such as Kac, argue that context-specific definitions are required. Kac argues for interactivity to only refer to dialogic exchange in a mediated environment, given that "in computer-based interaction works, interaction often becomes synonymous with operation, manipulation, or control."[155] Huhtamo also argues for more nuanced understandings of the term, in that while "interactive art can –and should– stretch the definition of interactivity and explore its limits" he asks whether the term should be "reserved to cases where active and repeated user-intervention plays a significant role in the functioning of the system" for it "to retain anything about its former distinctiveness."[156]

     Stelarc's *Prosthetic Head* (2003) (Figures 2-11, 2-12) exemplifies interrogating interactive interfaces along the lines advocated by Kac and Huhtamo. I saw Stelarc demonstrate it at the National Gallery of Australia in 2005[157] and interacted with it in Sydney later that same year.[158] Interrogators

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[154] Erkki Huhtamo traces the development of the term 'interactivity' and how it has come to be ubiquitous in these contexts in his article 'From Cybernation to Interaction: A Contribution to an Archaeology of Interactivity.' In *The Digital Dialectic: New Essays on New Media*, edited by Peter Lunenfeld, 96-111. Massachusetts: MIT Press. 2000.

[155] His implementation of this approach is discussed on p81 below.

[156] Huhtamo 2004:6. As a case-in-point, Huhtamo is specifically referring to the AE prize for 'Interactive Art' being awarded to Ben Rubin and Mark Hansen in 2004.

[157] Stelarc. 'Stelarc Reviews his Work with Robotics, Virtual Reality Systems and the Internet.' Presentation at The National Gallery of Australia, June 26 2004.

converse with a large 3D projection of a CGI animation of Stelarc's actual head by typing questions or statements on a keyboard and the 'head' verbally responding. *Prosthetic Head* uses dialogic exchange in a mediated environment to utilise "active and repeated user-intervention" so that interrogators play "a significant role in the functioning of the system." This arises since "what Stelarc calls the process of interaction" is the cumulative consequence of each Q-and-A encounter, as through Artificial Intelligence processes the 'head' learns to conduct 'better' conversations by incorporating vocabulary and grammar newly provided by each interrogator. In effect, Michelle Jensen argues that *Prosthetic Head* "becomes the sum of its interrogators" as "each interrogator supplies the data needed to expand it."[159] In reference to the six dominant responsivity-responsibility modes outlined in Chapter 1 on p26, participants have a one-to-one responsibility to the physical environment of the artwork in the real-time of their engagement and in their ensuing influences on the 'evolution' of the learning of *Prosthetic Head*. The artwork evokes environmental responsibility to the here-and-now which collectively influences the then-and-there of future states which cumulatively reflect the "sum of its interrogators." Accordingly, the artist's authorial responsibility is also indeterminately distributed to the artwork and each interrogator, as Stelarc argues the 'head' is "becoming more autonomous in its responses" through its learning, such that he can "then no longer be able to take full responsibility for what his head says."[160] These contested zones of responsibility fulfill Rokeby's criteria for "a good interaction system" wherein participants' actions are each "as much a question as a statement...in an unfolding dialogue in which neither the user nor the system is in complete control of the course of things"[161] as the "system" never knows what it will be asked, while interrogators will be increasingly unable to predict how the "system" will respond due to the "unfolding dialogue" between them.

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[158] Stelarc. *The Prosthetic Head* exhibition. Sherman Galleries, Sydney, May 13-19 2005.

[159] Michelle Jensen. *New Media and Interactivity*. Masters Dissertation. Sydney College of the Arts, The University of Sydney. 2006:21-22.

[160] Stelarc. '*Prosthetic Head* Program Notes.' *Stelarc's Website*. 2005. www.stelarc.va.com.au/prosthetichead. Accessed March 16 2007.

[161] Xavier Ess. *David Rokeby's Interview at Theatre Mercelis, Brussels*. 2003. www.imal.org/drokeby/archives/interview.html. Accessed September 5 2008.
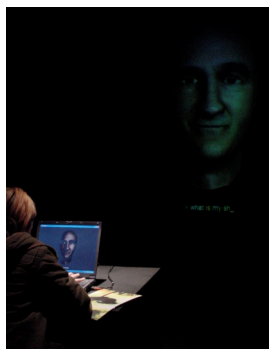
Figures 2-11, 2-12: Stelarc *Prosthetic Head* (2003)   Figure 2-13: Screen Capture of *Futurama* (2005)

In Rokeby's "good interaction system," interactivity and responsibility would be realised to their full potential of mutually reciprocal action in the Alife of "'art-as-it-could-be.'"[162] This would entail the interactionism of bi-directional causality between mind and body[163] rather than the sleight-of-hand of 'art-as-it-actually-is' which underpins the relationship between participants and *Prosthetic Head*. This discrepancy emerges as *Prosthetic Head* subliminally interrogates participants by analysing composite meta-patterns of participants' interactivity. In this interview-like relationship, *Prosthetic Head* illustrates the near pervasive power disparity between artists and audiences, wherein audiences can rarely interrogate artists to the same extent that artists interrogate audiences. To Rokeby this has "disturbing implications." He asks rhetorically whether such interrogation involves an "artist sending the audience, like rats, through a laboratory maze" where "they feel that their 'behaviour' is being judged."[164] The field of practice which emerged in light of these "disturbing implications" -Interaction Design- concerns how Artist-Artwork-Audience may interface to facilitate non-interrogational relationships.

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[162] McCormack 2004b:4.

[163] Interactionism is defined in the *Oxford English Dictionary* as "the theory that in the causal relations between mind and body the causal influence runs in both directions, in sensation from body to mind and in volition from mind to body." *Oxford English Dictionary* (Second Edition) s.v. 'Interactionism.' http://dictionary.oed.com/cgi/entry/50118744. Accessed September 5 2008.

[164] David Rokeby 'Transforming Mirrors: Subjectivity and Control in Interactive Media' (online version). 1995. http://homepage.mac.com/davidrokeby/mirrors.html. Accessed March 12 2006.

In popular usage the terms interface and interaction have become so merged that the field of Computer Human Interface is now termed Human Computer Interaction. Physically, an interface is the meeting point between otherwise incommensurable entities, where one is translated or transmogrified in terms of the other, such as a Graphical User Interface which renders computer code intelligible at the 'surface' level of the desktop. Behaviorally, interfacing refers to the plane at which entities (Human-Computer) or parties (Artist-Audience) engage one another, where interface means "to act together or affect each other or to make things or people interact."[165] Amidst the burgeoning of technological interfaces in society and art-at-large, the nascent area of Interaction Design concerns how audiences interact with an artwork and one another. Rokeby is adamant about the repercussions of Interaction Design for evoking multifarious responsibility, since interfaces are material devices relating artwork to audience and immaterial processes through which content is engaged with. He argues "the interface becomes the organ of conscience, the mechanism of interpretation, the site of responsibility" such that "the design of these technologies becomes the encoding of a kind of moral and political structure with its attendant implicit social contract."[166] Although an interface can be programmed, it is impossible to program how people may interface with it, if their autonomy and agency is upheld. Under the cloak of art, the dominion of programming computers has been extended to people, so that Khut describes his Interaction Design as incorporating "Experience Design."[167] This is ethically problematic for experience to remain

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[165] *New Oxford American Dictionary.* Mac OS10.4, s.v. 'Interface.' Interface as a verb is also defined in the *Oxford English Dictionary* as "to come into interaction with." *Oxford English Dictionary* (Second Edition) s.v. 'Interface.' http://dictionary.oed.com/cgi/entry/50119021?query_type=word&queryword=interface&first=1&max_to_show=10&sort_type=alpha&result_place=1&search_id=CBvd-7fhQ fA-923 &hilite=50119021. Accessed September 5 2008.

[166] Rokeby 1995a:155.

[167] George Khut. 'Interactive Art as Embodied Enquiry: Working with Audience Experience.' In *Engage: Interaction, Arts and Audience Experience*, edited by Ernest Edmonds, Lizzie Muller and Deborah Turnbull, 2007. Sydney: Creativity and Cognition Studios Press. This term was also used by Khut in his paper (of the same title) presented at *Engage: Interaction, Arts and Audience Experience* conference, Creativity and Cognition Studios, University of Technology, Sydney, November 26-28 2006. The conference was also run by *ACID - Australasian CRC for Interaction Design*, whose tagline is "designing the user experience." www.interactiondesign.com.au. Accessed March 16 2010.

beyond 'design,' even if interactivity is subsumed into a carefully 'designed experience.'

The discussion will now turn to the relevance of the Interactive Art elements just described to the 'sub-field' of Responsive Environments.

2.2.3 Responsive Environments

> A technology is interactive to the degree that it reflects the consequences of our actions or decisions back to us... To the degree that the technology reflects ourselves back recognizably, it provides us with a self-image, a sense of self. To the degree that the technology transforms our image in the act of reflection, it provides us with a sense of the relation between this self and the experienced world. This is analogous to our relationship with the universe.
>
> David Rokeby[168]

The introduction to this dissertation outlined Responsive Environments in relation to Kaprow's Environments and Krueger's formation of the notion of Responsive Environments. In this section, Responsive Environments are contextualised in their wider art-historical origins, as they also stem from challenges to artist-audience responsibilities initiated by Dada, Surrealism, Fluxus and Happenings.[169] As Krueger was first to articulate the particular challenges to using responsivity to evoke responsibility in Interactive Art, the following discussion is centered on him and related contemporary artists who explore these challenges, which are encapsulated in Rokeby's quotation above.

Although the concept of Responsive Environments has become more prominent in the last two decades within architecture,[170] design,[171] and

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[168] Rokeby 1995b.

[169] Eduardo Kac. 'Negotiating Meaning: The Dialogical Imagination in Electronic Art.' In *Bakhtinian Perspectives on Language and Culture; Meaning in Language, Art and New Media,* edited by Finn Bostad, Craig Brandist, Lars Evensen Sigfred and Hege Charlotte Faber. New York: Palgrave Macmillan. 2004:211.

[170] One of the foremost collectives is called *Responsive Environments* but they take a predominantly architectural and commercial designer approach. www.responsiveenvironment.com and www.responsiveenvironment. wordpress.com. Accessed March 16 2010.

[171] The two seminal texts for these approaches are *Responsive Environments: Architecture, Art and Design,* by Lucy Bullivant (London: Victoria and Albert Museum, 2006) and *Responsive Environments: A Manual for*

computer science,[172] in comparison with art-practice, these fields employ utilitarian, commercial or techno-centric approaches in which responsivity and responsibility are peripheral. For example, Responsive Architecture was founded in 1967 by Nicolas Negroponte through his Architecture Machine Group at MIT.[173] Although close in space and time to Krueger's 1969 coining of Responsive Environments at the University of Madison, Wisconsin, neither substantially relates to the other, due principally to being architectural and artistic endeavours respectively. Nonetheless, multi-faceted interactivity in Responsive Environments, such as those of *FoAM* and *Transmute Collective*, incorporates architecture, design and computer science.

In his approach to Responsive Environments, Krueger contextualised the artform as principally stemming from Environments and Dada. Significantly, *FoAM* and Garth Paine, a contemporary collective and artist respectively, also situate their approach to Responsive Environments within these same precedents. For Krueger, Responsive Environments extend the practice established by these precedents whereby "the artist surrendered immediate control, stepped back to a higher level, and gave the actors and the audience a level of control heretofore unknown."[174] However, in *From Participation to Interaction: Towards the Origins of Interactive Art*, Dinkla reasons that participants' unprecedented responsibility in Environments was actually "located along a fragile border between emancipatory act and manipulation"[175] since heightened audience responsibility was not matched by artists' relinquishing their authorial control. Krueger's notion that audiences requested such 'surrendering' by the 'subordinated' artists stepping "*back* to a *higher* level" is indicative of artists' emancipatory rhetoric of that era. Responsive Environments do not require artists to "*accept*" less authorial

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responsibility, as the voluntary and partial control offered over the "realisation of the piece"[176] is at their behest. However, in *Artificial Realities II,* Krueger's manifesto about Responsive Environments, he positions artist and audience responsibility as integral to the artform. He argues that "when participation becomes the subject of the aesthetic work, the viewer's critical faculties are given new responsibilities" such that "their own actions complete the piece. Thus, within the framework of the artist's exhibit, the participants also become creators."[177]

These "new responsibilities" hinged on technologically mediated participation that was inspired by the non-technological participation in Environments and Plastic Art belonging to Manovich's "Duchamp-Land"[178] of conceptual/theoretical/fine-art orientated artforms. Penny terms such artforms "pre-electronic"[179] due to their segue to electronic Responsive Environments. However they had incommensurable forms as they could not involve the science and technology that are integral to Responsive Environments. Consequently, "Duchamp-Land" artforms may evoke relatively metaphorical responsivity, since they cannot embody "an awareness of the contradictions inherent in mediated interactivity,"[180] such as evoking responsibility to the natural environment via inexorably complex Responsive Environments. Nevertheless, Penny argues for the contemporary relevance of artists such as Max Ernst, Man Ray, El Littizsky and Jasper Johns, as their Plastic Art evoked conceptual 'interaction' by pioneering strategies for "dissolving the artist/audience division" by using "user 'interface' and 'interaction' as their subject matter before anyone thought of the terms."[181]

Responsive Environments also draw on Environmental Art, which Sam Bower, the Executive Director of greenmuseum.org, defines "as an umbrella

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[176] Krueger 1991:44.

[177] Krueger 1991:91-92.

[178] Manovich 1996.

[179] Penny 1997a.

[180] Rokeby 1995b.

[181] Penny 1995b. Examples of Max Ernst and Jasper Johns are discussed in Chapter 4 on p172.

term to encompass…'ecological art'…'land art'" and "'art in nature.'"[182] While these artforms are non–technological, non-performative and non-participatory, their relevance for Responsive Environments stems from their qualities of construing artwork-as-Environment and of engaging with natural environments as part of the artwork. Responsive Environments incorporate the qualities of Kaprow's Environments in conjunction with the indeterminate causality of Environmental Art, as they may augment the human-powered responsivity within Environments with computer-powered biomimetic responsivity. These influences are outlined on the first page of *Artificial Realities II*. Krueger posits Responsive Environments to explore contradictions between two unknown 'Others': "benign Nature" from an unobtainable and unvanquished "Nature" of time immemorial and the immanent yet elusive future of "technological developments that make us anxious."[183] One approach to exploring these contradictions is in how Responsive Environments may evoke Environmental Art processes where responsivity occurs in Deep/Geological Time of eons. Responsive Environments may biomimetically evoke natural processes (such as evolution and adaptation) by collapsing 'real' spatio-temporal processes on the order of magnitude of millions-to-one. As an example of how this mandate has been taken up, *FoAM's groWorld* evoked the "out of reach" properties of "biological growth" with human spatio-temporal scales. While offering the immersive and participatory qualities of Kaprow's Environments, technology is pivotal for such Responsive Environments, as *groWorld* used technology to connect these two scales and responsivity types so as to "inspire more responsive (and perhaps responsible) forms of design, engineering and social organisation."[184]

    The uptake of such science and technology stems from the influence of Manovich's "Turing-Land"[185] of technological/scientific/experimental

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[182] Sam Bower. *A Profusion of Terms.* 2007. www.greenmuseum.org:generic_content.php%3Fct_id=306. Accessed 19 July 2007. His definition also includes "ecoventions", "earth art" and "earthworks." greenmuseum.org is an online organisation promoting Environmental Art.

[183] Krueger 1991:xi.

[184] Maja Kuzmanovic and Nik Gaffney. 'Structured Growth and Grown Structures.' Paper presented at *Subtle Technologies Conference*, Toronto, May 30 - June 1 2006. 2006:4. http://fo.am/node/1343. Accessed March 17 2007.

[185] Manovich 1996.

artforms. "Turing-Land" had particular relevance for the formation of Responsive Environments, as the appropriation of computers into art in the 1960s led to increasingly technological artforms that explored Artist-Artwork-Audience interaction in light of Cybernetics and Systems Theory. The necessity of science and technology to Responsive Environments was expressed by Burnham, an art theorist in the 1960-70s, who held that increasing connections between art, science and technology would create contexts through which to explore heretofore inaccessible zones of responsibility between Artist-Artwork-Audience. In relation to 1970s kinetic sculpture and robotics he predicted that "an aesthetics of artificial intelligence will evolve" so that corresponding artforms with "true intelligence" would offer "reciprocal relationships with human beings"[186] before the 21st Century. The apotheosis of this is discussed below on p98 with regard to evoking environmental responsibility through Alife approaches to Responsive Environments.

Krueger similarly aspired toward artforms that could offer "reciprocal relationships" with participants. A central preliminary in Krueger's projected trajectory was the inculcation of participants' awareness of their influences, so that "participants should be aware of how the environment is responding to them."[187] This is pivotal, as the challenges for cultivating participants' awareness of responsivity are fundamental for evoking environmental responsibility. Krueger reasoned this since audiences are not expected "to admire invisible paintings or to listen to inaudible music, interactive art is pointless if the audience is not cued in to it."[188] However, Robert Rauschenberg's *White Paintings* (1951) (Figures 2-14, 2-15) expected "people to admire invisible paintings" and John Cage's *4'33* (1952), expected people to "listen to inaudible music." These seminal and controversial works involved audiences "not cued in to it," yet were integral to "alter perception, and to define a new category of beauty,"[189] which is central to Krueger's criteria for

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[186] Jack Burnham. *Beyond Modern Sculpture: The Effects of Science and Technology on the Sculpture of this Century.* New York: George Braziller. 1968. His predictions for such artforms became more sombre, as expressed in 'Art and Technology: The Panacea that Failed.' In *The Myths of Information: Technology and Post-Industrial Culture,* edited by Kathleen Woodward, 200-218. Bloomington: Indiana University Press. 1980.

[187] Krueger 1991:42.

[188] Krueger 1991:17.

[189] Krueger 1991:17.

the aesthetics of interactivity in Responsive Environments. Accordingly, Krueger acknowledges the pervasive influence of Rauschenberg's *Soundings*, which in Dinkla's view forms the prototypical "reactive environment"[190] as it offered an immersive Environment for participants to actively manipulate the sonic and haptic media of the artwork.
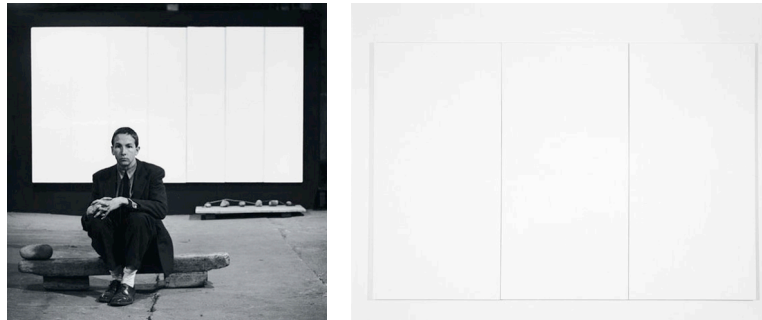
Figures 2-14, 2-15: Robert Rauschenberg *White Paintings* (1951)

The direct linear causality in *Soundings* restricted the Environment to being "reactive," while Krueger sought to create Environments that were responsive, according to behaviour arising via computational interactivity. Under the heading "Response is the Medium!" Krueger calls for a responsivity "that engages participants in dialog" whereby "the medium…accepts input from or about participants, and then responds in ways those people can recognise as corresponding to their behaviour."[191] Causality is integral "to define relationships between the participants' actions and their perceived consequences" since "the laws of cause and effect are composed by the artist" such that "it is the composition of the relationships between action and response that is important."[192] However Krueger advocates highly deterministic Human Computer Interaction, wherein "the artist anticipates the participant's possible reactions and composes different response relationships for each alternative" while "the participant explores this universe, initially triggering responses inadvertently, then gradually becoming more and more aware of

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[190] Dinkla 1996:281.

[191] Krueger 1991:86.

[192] While Krueger interchangeably describes his work as "Responsive Environments" and "Artificial Realities," I use Responsive Environments since this is the most relevant aspect of his work and "Artificial Realities" is problematically differentiated from Augmented Reality, Virtual Reality and Mixed Reality. Krueger 1991:86.

causal relationships."[193] Given participants' diverse experience/
background/familiarity, Krueger downplays participants' individual agency by
presupposing their progression from ignorance to understanding.
Furthermore, anticipating "the participant's possible reactions" is logically and
technically impossible as this would require finite and programmable human
behaviour. His design credo that "the computer should adapt to the human,
rather than the human adapting to the computer"[194] is also self-contradictory,
as in the above scenario humans adapt to the computer as they modify their
behaviour to match their growing awareness of the causality "composed by the
artist."

These internal contradictions pervade contemporary practice rather
than stem from an inadequacy peculiar to Krueger's approach. His ideas
permeate contemporary practice, although they are now taken up self-
reflexively. Three seemingly disparate examples include the above mentioned
'Experience Design' with its desire to anticipate 'all' possible responses (p72),
Feingold's reaction against this design credo for authorial responsibility (p34
and p84), and Rokeby and Huhtamo's analysis of audience interactivity that
overwhelmingly reaffirms participant progression from ignorance to
understanding via Rokeby's 'First Test of Interactivity' (p142). However the
discrepancy between Krueger's practice and current Responsive Environments
is exemplified in his emphasis on surveillance-derived interactivity, which has
not been followed by Rokeby, Penny and *FoAM* though they are heavily
influenced by him. Whereas Krueger's interactivity relied heavily on
surveillance (rather than sensing) apparati, in *Human-Scale Systems in
Responsive Environments*, *FoAM* advocate "systems that can sense (rather than
detect) not just presence or absence, but the range and subtleties of human
gestures and interactions."[195] This departure stems from Rokeby's critique that
Krueger's use of surveillance had "effectively taken control of the interactors'
subjectivity [by] depriving them of their idiosyncratic identity." Rokeby found

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[193] Krueger 1991:xii-xiii.

[194] Krueger 1991:xiv-xv. Emphasis in original.

[195] Maja Kuzmanovic and Nik Gaffney. 'Human-Scale Systems in Responsive Environments.' In *Proceedings of 2005 IEEE International Conference on Multimedia* Volume 12(1), edited by Sethuraman Panchanathan. Arizona: IEEE Computer Society. 2005:10. http://fo.am/node/290. Accessed March 12 2006.

this problematised participant responsibility, since identity deprivation means that "the fact that the system responds to the interactor does not guarantee in any way that the system is responsible to the user."[196] Rokeby creates artworks that are responsive to the participant while the participant is responsible to them, as demonstrated in more than 25 years of producing re-iterations of *Very Nervous System* (1982-2004), his most acclaimed work, which stems from Krueger's *Videoplace*.[197]

The quotation from Rokeby at the start of this section expresses how interactivity in Responsive Environments influences behaviour in Outside quotidian environments as the evoked Inside-Outside relationship "is analogous to our relationship with the universe."[198] For the same reason, Penny advocates sensing idiosyncrasy over detected surveillance, due to the artist's "ethical responsibility regarding cultural objects which might function as training environments to build behaviours which will ultimately be expressed in the real world."[199] Due to the evocation of Outside responsibility within the environment of the artwork, as influenced by the artist's design of responsivity, Rokeby is adamant that, based on his "experience creating and exhibiting interactive systems…the creation of interactive interfaces carries a social responsibility."[200] This relationship between responsivity and responsibility is explored in the next section.

2.2.4 Responsivity and Responsibility

The interrelationship between responsibility and responsivity occurs due to two further properties they invoke: reciprocity and dialogism. Andrew

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[196] Rokeby 1995b.

[197] Erkki Huhtamo. 'Adventures in Middle Space.' *Horizon Zero* Volume 3. Banff: The Banff Centre for the Arts. 2002. www.horizonzero.ca/flashindex.html. Accessed September 5 2008. *VNS* is discussed on p139.

[198] Rokeby 1995b.

[199] Simon Penny. 'Representation, Enaction and the Ethics of Simulation.' In *First Person New Media as Story, Performance and Game*, edited by Pat Harrigan and Noah Wardrip-Fruin. Massachusetts: MIT Press. 2004:80. http://ace.uci.edu/penny/texts/ethicsofsimulation.html. Accessed March 12 2006.

[200] Rokeby 1998.

Schaap argues that "the wider ethical conception of responsibility…refers to an obligation 'to respond' in the sense not only of being *accountable for* but of being *responsive to*."[201] Referring to Paul Ricoeur's discussion of ethics,[202] Schaap employs the "metaphor of a balance book" as an analogy for a reciprocal responsivity between two entities, based on "moral bookkeeping" centred on a "balance" between "positive or negative."[203] Reciprocity and dialogism emerge from these relations since that which is responsive is inherently dialogical with regard to reciprocity. That which is reciprocal is inherently responsible (or irresponsible in the scenario of Mutually Assured Destruction). The responsiveness of dialogism is explicit in these relations. Dialogical is defined in *The Concise Oxford Dictionary of Literary Terms* as being "constituted by the interactive, responsive nature of dialogue rather than by the single-mindedness of monologue"[204] especially with regard to Mikhail Bakhtin's dialogism and Martin Buber's interactional sociolinguistics.[205]

Kac alludes to Bakhtin and Buber when discussing responsibility in his practice. In *Negotiating Meaning: The Dialogic Imagination in Electronic Art*, Kac critiques the inability of prevailing exemplars of interactivity to evoke responsibility. Accordingly his practice gives "precedence instead to interrelationship and connectivity" as they "enable the emergence of dialogic artworks" (Figures 2-16, 2-17). Dialogism is pivotal for evoking environmental responsibility as Kac argues that communication "must imply bi-directionality or multiple directionality" which implies a "shared spatiotemporal responsibility"[206] between co-participants. He argues that the Inside-Outside relationship is viable for evoking Outside responsibility through "both the aesthetic bidirectionality of the art experience as well as the ethical awareness

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[201] Schaap 2004:3. Emphasis in original.

[202] Paul Ricoeur. 'The Concept of Responsibility.' In *The Just,* translated by David Pellauer. Chicago: University of Chicago Press. 2000:14.

[203] Schaap 2004:3.

[204] *The Concise Oxford Dictionary of Literary Terms* (Third Edition) s.v. 'Dialogical.' Oxford: Oxford University Press. 2008. www.oxfordreference.com/pages/subjects_and_titles__2e_l05. Accessed September 5 2009.

[205] Kac 2004:210.

[206] Eduardo Kac. 'Dialogical Telepresence and Net Ecology.' In *The Robot in the Garden: Telerobotics and Telepistemology in the Age of the Internet,* edited by Ken Goldberg. Massachusetts: MIT Press. 2000:201.

of the social implications of the work."[207] As two of the few practitioner-theorists arguing strongly for reciprocity and dialogism, both Kac and Rokeby acknowledge these ideals are problematically realised in 'art-as-it-actually-is.' Kac's article title expresses this: while negotiation has to involve dialogue, it is yet an unobtainable potentiality within "The Dialogic Imagination." This conundrum is encapsulated in the following discussion on the indexical relationship between responsivity and responsibility.
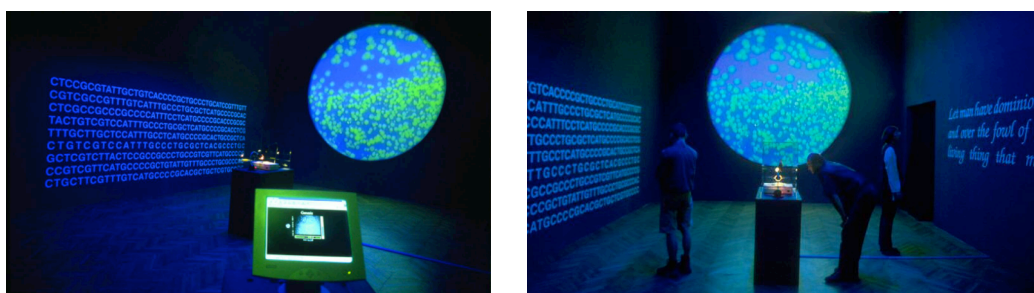
Figures 2-16, 2-17: Installation views of Eduardo Kac *Genesis* (1999)

All environments -social, physical and natural- are essentially capable of responsivity, but only some are interactive. Outside, in the natural environment, when a person picks a flower it responds (by starting to die). Inside, in a physical environment, when a sculptor sculpts a piece of metal by pushing it, it responds (by moving in the direction of the applied force). However, such responses are not interactive. Combining responsivity with interactivity can form a middle ground between these extremes. Gardening is an oft used analogy for this middle ground and is central to the environmentalist ethos of the corpus in Chapter 3. In gardening, cumulative interaction arises from the dialogue between gardener and semi-autonomous nature. A gardener is responsible for cultivating the vegetation (including planting seeds, picking flowers and pruning branches) in a negotiated balance between the autonomy of the natural vegetation and the human influence that fashions vegetation into a garden.

Responsivity inherent to Outside natural environments is only shared by Inside "engineered environments"[208] that manifest synthetic responsivity.

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[207] Kac 2000:207.

[208] Dorin 2004:77.

Accordingly, high levels of responsivity through dialogical interactivity necessitate corresponding levels of participant responsibility. Such 'free flowing' dialogues are generally restricted to artworks with one-on-one interactivity, as combining a "'broad bandwidth' of interaction"[209] with many-to-many interactivity is liable to turn otherwise intelligible conversation into an incomprehensible cacophony of co-participants speaking over the top of one another, rather than with one another and the artwork. Correspondingly, low levels of responsivity occasion low levels of responsibility but may be more appropriate for artworks with many-to-many interactivity wherein 'conversation' is limited to relatively trammeled processes. Such interactive modalities may evoke co-participants' responsibility to the social and physical environment of the artwork, as simpler responsivity can more predictably respond to the diversity of group behaviour, whereby individual participants may be cognisant of their respective influences. Between these two extremes lie differing tiers of artist and audience responsibility, as they negotiate their respective authorship of the artwork and/or the execution of the artwork.

2.2.5 Authorship: Between Artist, Artwork & Audiences

> Interactive artists are engaged in changing the relationship between artists and
> their media, and between artworks and their audience. These changes tend to
> increase the extent of the audience's role in the artwork, loosening the authority
> of the author or creator. Rather than creating finished works, the interactive artist
> creates relationships.
>
> David Rokeby[210]

At all levels of responsivity, Artist-Artwork-Audience relations may produce triadic interrelationships in the sense of a musical triad. Combining three pitches simultaneously at even intervals one third apart creates a 'harmonious' sound as the frequencies form mathematically harmonious ratios. However, the equilaterally triangulated nexus thus formed:

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[209] David Rokeby. 'The Harmonics of Interaction.' *Musicworks* Volume 46. 1990. http://homepage.mac.com/davidrokeby/harm.html. Accessed March 12 2006.

[210] Rokeby 1995b.

A
AA

does not denote egalitarianism between elements. Rokeby's writings on the "harmonics of the interaction"[211] and Penny's notion of "Synthetic Sociality"[212] posit artist and audience as figuratively interrogating one another from 'opposing' sides of the triangle, with artworks acting as intermediary. Evoking audience responsibility is hindered by audiences being a highly varied entity amidst the generally unidirectional interrogation of audiences by artists via the artwork, such as the example of Stelarc's *Prosthetic Head* described above (p69).

In light of Rokeby's description (at the beginning of this section) of how interactivity affects artist-audience relations, practitioner-theorists seek to clarify respective roles and responsibilities of artists and audiences through more nuanced and accurate categorisation of their statuses.[213] Feingold reasons that artists anticipate audiences' roles since "one initially has to put oneself in the position of the one who will encounter this work in a public place." This raises an intractable problem for creating art (in contrast to Design), as he contends that

> imaging oneself as another, adds a layer to the creative process, which is highly
> problematic. Can I imagine myself as another, or do I imagine them as myself? Is
> there a loss of integrity when the artist tries to imagine his or her audience, as if
> targeting a product for a market?[214]

In *The Myth of Interactivity or the Interactive Myth*, Kristoffer Gansing argues that establishing audience responsibility is highly problematic, as audiences oscillate between such states as his notion of "active spectatorship"[215] and "interpassivity"[216] (a term used by Latitia Wilson in

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[211] Rokeby 1990.

[212] Penny 1996b.

[213] An example is the Ludwig Boltzmann Institute's analysis of categories of Interactive Art in AE, which is discussed on p67.

[214] Feingold 2002:126.

[215] Kristoffer Gansing. 'The Myth of Interactivity or the Interactive Myth.' In proceedings of *Melbourne Digital Arts and Culture 2003*, edited by Adrian Miles. Melbourne: Royal Melbourne Institute of Technology. 2003:42.

[216] Laetitia Wilson. 'Interactivity or Interpassivity: a Question of Agency in Digital Play.' In *Proceedings of Perth Digital Arts and Culture 2003*, edited by Adrian Miles. Melbourne: Royal Melbourne Institute of Technology. 2003:2.

Interactivity or Interpassivity: A Question of Agency in Digital Play). Attendees' statuses may vary immensely over the duration of their engagement with an interactive artwork, subject to innumerable moment-by-moment variables of their own and others' behaviour, the different approaches of other people to the same work (such as a passive response to an interactive work) and the particular influences the work allows (such as real-time instant responsivity and/or cumulative and collective influences over an evolving artwork). These variables create equivalent variance in authorial responsibility.

The stage at which attendee interactivity commences in the production timeline of an artwork affects their ability to be responsible for their behaviour when engaging with the content, which may include contributing content to the artwork. Attendees generally commence their engagement after content creation, and the design of the form by which the content is engaged with, has been completed. Even if real-time content is derived from sensing their behaviour, such works are, in effect, hermetically sealed, in which participants co-author their experiences with one another when executing the work in real-time. Their responsibility to the physical environment (and the social environment in one-to-many and many-to-many artworks) is determined by the extent to which they may 'author' the real-time behaviour of an artwork with largely pre-determined content and form. In contrast, participants have considerably more responsibility in generative systems which evolve via a gardening like process. Earlier participant involvement fosters greater responsibility for the evolution of the work, as it is analogous to planting seeds which continue to grow after they have finished interacting with the work. Analogies between responsibility in gardening and responsibility in a Responsive Environment are central to Latham and Todd,[217] *FoAM,*[218] Sims,[219]

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[217] Whitelaw writes that "Latham and Todd introduce an analogy linked to this twofold artistic role that suggests another important side to the constructions of agency operating in these systems. 'The artist first creates the systems of the virtual world…then becomes a gardener within this world he has created.'" Whitelaw maintains that Latham and Todd "frequently refer to these roles simply as artist-creator and artist-gardener." Mitchell Whitelaw. *Metacreation: Art and Artificial Life.* Massachusetts: MIT Press. 2004:56.

[218] *FoAM's* artwork *GroWorld* creates "a network of…hybrid gardens, in which the physical sites (pocket-ecologies) are connected to each other through a persistent 3D virtual, online *GroWorld*" such that events and conditions within the physical sites can directly influence the evolution of the online world, making it grow and

Machiko Kusahara,[220] Rokeby,[221] Riika Pelo,[222] Armstrong[223] and McCormack.[224] However responsibility for exerting real-time influences which also condition future states of the work may be beyond the capacity of most participants due to the potentially onerous amount of responsibility required from participants.

As an example of the extent of attendee variability, Andrew Brown, from the Australasian CRC for Interaction Design, proposed the term

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decay, shrink and expand, mutate or homogenise - becoming an increasingly autonomous, distributed wilderness or a tamed, cultivated work of art." Kuzmanovic 2001a.

[219] Kevin Kelly writes of Sim's *Genetic Images* that it "is a joint product of breeding machine and human gardener. Sims sees a future for artists as agents who don't create specific images, but instead create novel processes for generating new images. The artist becomes a god, creating an Eden in which surprising things will grow." 'Genetic Images.' *Wired* Volume (2)9:114. 1994. www.wired.com/wired/archive/2.09/sims.html. Accessed March 12 2006.

[220] In her work *Telegarden* Kusahara writes that "a garden is a field of possibilities, and so is the *Telegarden*…the garden is a field that elicits communications among its users…users can participate if they agree to revel their names and email addresses to other users. Each user accepts responsibility for maintaining the garden and respecting others…the garden on the internet is a Commons in the traditional sense (as in Boston Common). It literally offers users a common ground. A Commons elicits and requires communications among users." Machiko Kusahara. 'Presence, Absence, and Knowledge in Telerobotic Art.' In *The Robot in the Garden: Telerobotics and Telepistemology in the Age of the Internet*, edited by Ken Goldberg. Berkeley: University of California. 2000:206.

[221] Rokeby and Erik Samakh's *Petite Terre* (1992) involved a 1x1 metre bonsai garden with embedded sensors that played animal sounds that from inside the garden. The sounds were influenced by human motion in the near vicinity of the garden, with the basic premise being that approaching the garden caused the sounds to cease while a participant was in close proximity to the garden. '*Petite Terre* Program Notes.' *David Rokeby's Website.* 1992. http://homepage.mac.com/davidrokeby/pt.html. Accessed September 5 2008.

[222] Her artwork *Marina's Garden* is discussed below on p112.

[223] Of his work *Transit Lounge* Armstrong remarked that "its most obvious ecological metaphor lay within its 'digital flower garden,' which formed the heart of the work." Armstrong 2002:266.

[224] Regarding *Future Garden* McCormack says "in their simplest form, gardens are human arrangements of nature, though the very fact of their construction makes them unnatural" and then cites Wilson's *Biophilia*. His work *Future Garden* was "a meditation about how the concept of a garden might be reformulated…from the perspective of contemporary ideas in artificial life, artificial nature and generative systems." McCormack 2004:97. It would have cumulatively developed via "memory traces" derived from "patterns of behaviour of people and the local environment" so it would be "constantly evolving to its environment." This constructed a "meditative experience of nature *in silico*" which he envisaged as having neither "end or purpose," as it was biomimetically modelled on biological evolution. Jon McCormack. 'Art and the Mirror of Nature.' *Digital Creativity* Volume 14(1). 2003:15-17.

"Appreciator" for someone who "attends but does not influence the work."[225] This term raises further questions: Can someone appreciate something if they do not interact with it? What if they choose to not influence a work precisely because they do not appreciate it? Devising such terminology of audience categories is akin to Graham's "unending, obscure task dedicated to pinning down the intangible" of her Interactive Art taxonomy in her PhD. However, in respect of authorship I also found "some kind of classification might be useful."[226] It remains to be seen whether establishing categories of authorship can represent the actual nuances of authorial responsibility occasioned when art is made to be interactive.

The shared etymology between authority and authorship suggests that authorial responsibility in Responsive Environments can be positioned along a continuum from Authoritative Authorship ('traditional' omnipotent authorial control); Authorised Audience Authorship (audience contributions authorised by 'The Author'); Unauthorised/Authoritative Audience Authorship (audience contributions unauthorised by 'The Author'); to Authorised Anti-authoritarian Anti-authoritative Authorship (artworks whose authorship may embrace high levels of unpredictable sentient influences). This continuum can be equally applied to co-creators' collaboration, as Responsive Environments generally require collective authorship that transcends the abilities and resources of any single author. These categories exist along the same continuum described in Whitby's analogy at the beginning of this chapter: Authoritative Authorship denotes a minimally interactive "finished construction," or "built house," which requires minimal audience responsibility, while Authorised Anti-authoritarian Anti-authoritative Authorship denotes a highly interactive "load of bricks" which may learn, adapt or evolve according to participants' cumulative patterns of interaction. Returning to Kaprow's *Words*, with which this dissertation began, the continuum extends from restriction allowing rearrangement of only whole words on this Environment's 'bulletin boards,' only for them to revert back to their prior position after someone 'completes'

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[225] This term was defined in 'Modes of Creative Engagement,' his presentation at *Engage: Interaction, Arts & Audience Experience* conference, Creativity and Cognition Studios, University of Technology, Sydney, 26-28 November 2006.

[226] Graham 1997:38.

their re-arrangement, to freedom to edit and write new words to form new sentences that exist for future participants to read and/or re-edit if they choose.

In *Models of Authorship*, Manovich examines Barthes "death of the author" and the inferred 'rise of the reader' in remixing and sampling electronic artforms. His views on Interactive Art are conveyed succinctly in his heading *Interactivity as Miscommunication Between the Author and the User.* Manovich argues against viable collaborative interaction with evolving or adapting works, as interacting with even a hermetically sealed work is still dominated by "'miscommunication' between the author and the user"[227] about roles and responsibilities. Graham similarly argues that "'the death of the author'" is exemplified by this culture of re-appropriation, involving the "power of the reader to not only re-read, but to change the order and form"[228] of artworks. However Barthes' "death of the author"[229] does not resolve the ambiguity between whether it is the author, or the concept/notion/category of the author, that has died. Hence Section 1.5.1 is called "Executing the myth of the tortured artist" as these artforms are not literal executions.

The prevailing categories of 'User' and 'Audience' arise from generalisations made by many artists about audience interactivity and behaviour. Both terms blur the boundaries between artists' and audiences' responsibility since "'the user'" implies "the artwork is at the service of that person" suggesting "an imbalance in the relationship between person and artwork."[230] In contrast, the artists in this dissertation have sought more nuanced terminology to delineate respective responsibilities. Examples include Augusto Boal's transformation of spectator to "spectactor"[231] in his manifesto on Participatory Art, Seaman's hybrid "vuser (viewer/user)" to describe the oscillation between 'passive viewer' and 'active user' in their "inter-

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[227] Lev Manovich. 'Models of Authorship in New Media.' *SWITCH Journal* Volume 7. http://switch.sjsu.edu/ nextswitch/switch_engine/front/front.php?cat=44. Accessed July 12 2008. Manovich's dismissal of the potential for interactivity in art is expanded upon in his *The Language of New Media*. Massachusetts: MIT Press. 2001.

[228] Graham 1997:37-8.

[229] Roland Barthes. *Image, Music, Text*, translated by Stephen Heath. London: Fontana Paperbacks. 1984.

[230] Rokeby 1995a:157. Despite not finding a "satisfactory term" Rokeby prefers the term "'interactor.'"

[231] Augusto Boal. 'Games for Actors and Non-Actors.' In *Theatre Of The Oppressed*, translated by Maria Leal McBride and Charles Odilia, 132-156. New York: Theatre Communications Group. 1985.

authorship"[232] of his work, Kac's "interactants,"[233] Char Davies' "the 'immersant'" to describe people engaging with her Responsive Environment *Osmose,*[234] Paine's "inhabitants" to describe people engaging in his "interactive responsive environments,"[235] Joanna Jakovich's "inhabitant"[236] to describe people engaging in her interactive installations, Feingold's hyphenated "viewer-participant" in his *The Surprising Spiral,*[237] Graham's notion of artist's "'host'"[238] role, Armstrong's similar notion of "stewardship"[239] involving artists as "designer/architect" or "manufacturer/builder"[240] and *FoAM's* argument for "artists [to] become more like architects or instrument makers, rather than creators of a finished piece of 'art'"[241] to the extent they advocate removing the terms "'author'" and "'content provider.'"[242] *FoAM's* contribution becomes a "'context provider'" for "'content'" that is a "distributed" co-creation "between the facilitators, the entities experiencing the environment"[243] and the apparati used to construct the Responsive Environment. In contrast, Huhtamo rejects

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[232] Bill Seaman. 'Recombinant Poetics: Emergent Explorations of Digital Video in Virtual Space.' In *New Screen Media: Cinema/Art/Narrative*, edited by Martin Rieser & Andrea Zapp. London: British Film Institute. 2002:237.

[233] Kac 2004.

[234] Thomas Campanella. 'Eden by Wire: Webcameras and the Telepresent Landscape.' In *The Robot in the Garden: Telerobotics and Telepistemology in the Age of the Internet*, edited by Ken Goldberg. Berkeley: University of California. 2000:37.

[235] Garth Paine. *The Study of Interaction Between Human Movement and Unencumbered Immersive Environments.* PhD Dissertation. Faculty of Art, Design and Communication, RMIT University, Melbourne. 2002:116.

[236] This term was defined in Jakovich's presentation at *Engage: Interaction, Arts & Audience Experience* conference, Creativity and Cognition Studios, University of Technology, Sydney, 26-28 November 2006. By extension audiences can be considered 'dwellers,' as an inhabitant generally refers to someone inhabiting their own home, but a visitor in public spaces may be said to be 'dwelling.'

[237] Feingold 2002:123.

[238] Graham 1997:145.

[239] Keith Armstrong. 'Towards an Ecosophical Praxis of New Media.' In *Proceedings of Melbourne Digital Arts and Culture 2003 Conference*, edited by Adrian Miles. Melbourne: Royal Melbourne Institute of Technology. 2003:96.

[240] Armstrong 2002:106.

[241] Kuzmanovic and Gaffney 2005:10. This raises the issue of if the artists are the instrument makers, who is playing who? Are audience members the cogs in the wheel or the instrument itself? Analogies between Responsive Environments and instruments are discussed in Paine (p123) and Rokeby's (p145) practice.

[242] Maja Kuzmanovic. 'Sensual Communication in Hybrid Reality.' Paper presented at *Consciousness Reframed III* conference, University of Wales, Newport. 2001:2. http://fo.am/node/1352. Accessed March 12 2006.

[243] Kuzmanovic 2001b:2.

the notion that artists relinquish their authorial responsibility according to Barthes' "death of the author." Instead, he argues artists become "merely a context-maker, who provides the basic ingredients, sets up the situation, and then disappears."[244]

FoAM and Armstrong as 'architects' providing the "basic ingredients" and recipes for Jakovich and Paine's 'inhabitants', represent the opposing extreme to Whitby's position outlined in the cooking and architecture analogies that began this chapter. Whitby's contention that audiences prefer "a built house" rather than "a load of bricks" is at odds with these artists. Between the two extremes of a rigid inflexible structure ("a built house") or an unstable and unlivable structure ("a load of bricks") lies an elusive middle ground. Seaman found in his PhD artwork, *The World Generator* (1996-7), that such "a delicate balance" stemmed from negotiating authorial responsibility between "that which the initial author imbues in the system in terms of content and that which the vuser contributes in terms of their input."[245] By Huhtamo's model, Seaman provided "the basic ingredients" and the context and then had figuratively disappeared, according to the "inter-authorship"[246] of his work. Seaman extrapolates from this model to the pervasive issue of balance, leading on to Perry Hoberman's summary of this challenge:

> In interactive art, we can find two seemingly opposite tendencies in the approaches to interaction: on the one hand a sharing (or even an abdication) of responsibility (or intentionality) on the part of the author; and on the other, a remarkable extension of the author's domain, an unprecedented attempt to control his/her audience and their response on every level.[247]

The second half of this chapter now explores contemporary practitioner-theorists' strategies for evoking environmental responsibility in Responsive Environments by balancing between these extremes.

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[244] Erkki Huhtamo. 'Seven Ways of Misunderstanding Interactive Art.' In *Digital Mediations*. Pasadena: Williamson Gallery of the Art Center College of Design. 1995. www.sophia.smith.edu/course/csc106/readings/interaction.pdf. Accessed March 12 2006.

[245] Seaman 1999:101.

[246] Seaman 2002:237.

[247] Perry Hoberman. 'Free Choice or Control.' In *Prix Ars Electronica 96*, edited by Hannes Leopoldseder and Christine Schöpf. New York: Springer Wien. 1996:53. Cited in Seaman 2002:237.

2.3 The Balance of Trade-Offs/a.k.a Strategies for Solutions

> The challenge has been to achieve the right balance in restricting or ceding creative control to the user. In many ways my goal was to deliver both simple, fluid interactivity, empowering the user to create in diverse ways. In actuality I found that one compromises the other, introducing more functionality encroaches upon how fluidly we are able to interact.
>
> Karl Willis[248]

Whitby's analogy that began this chapter refers to the organicist basis of Responsive Environments being made from a "load of bricks" that are composed into configurations. These units are also referred to as "primitives"[249] in McCormack's computer code or "interactive granularity"[250] in Willis' audiovisual mediums. All refer to the size, form and micro-structure of the components and their associated means for being combined into macro-structures that collectively create Responsive Environments. In the three most commonly used media of words, images and sounds, the smallest may respectively be phonemes, pixels and, through granular synthesis, sound particles of roughly 25 microseconds. Primitives heavily influence the evocation of responsibility as they determine the relationship between content, form and Interaction Design.

In his practice, Willis posits "the challenge" as being about achieving the "right balance" between the size of primitives and their corresponding interaction modalities. This balancing act requires a compromise, which Willis terms "the balance of specification,"[251] being the relationship between primitive size and interactive potentiality. Negotiating this relationship is instrumental for balancing the binaries of authority-control, determinacy-indeterminacy, simplicity-complexity and narrativity-interactivity. This negotiation is pivotal as

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[248] Karl Willis. 'User Authorship and Creativity within Interactivity.' In *Proceedings of the 14th ACM International Conference on Multimedia.* New York: Association for Computing Machinery Press. 2006:20.

[249] Jon Bird. 'Containing Reality.' In *Impossible Nature: The Art of Jon McCormack*, edited by Jon McCormack. Melbourne: Australian Centre for the Moving Image. 2004:45.

[250] Karl Willis. 'Open Interactions: The Balance of Specification.' Paper presented at *Biennale of Electronic Arts Perth*, Perth, September 1-7 2004. 2007:8.

[251] Willis 2007:9.

the trade-off within each binary affects the trade-off between other binaries. As an example, determining the size of the primitives affects all four binaries, with smaller primitives permitting "more functionality" and hence difficulty of interaction, with larger primitives offering less functionality and hence more "simple" interactivity in Willis' above scenario.

Balancing primitive size with interaction modality is not readily apparent without a guiding principle or rationale. For this thesis, this concerns the creation of Responsive Environments to evoke environmental responsibility in the interaction between artist, artwork and audience. In applying this rationale to Whitby's analogy, Responsive Environments made from smaller Lego sized "bricks" create greater scope for audiences to recombine them into more complex and diverse structures. In contrast, larger Duplo sized bricks have less recombinant potentiality which limit audience responsibility to interacting with relatively inflexible structures. Willis positions the innumerable options for arriving at a "balance of specification" along a "scale [where] finer granularity provides smaller individual elements with which the interactor can begin to construct and create in diverse ways" (as represented by Lego) while "coarser granularity with larger individual elements" allows for a "merely *selective*,"[252] or in Lunenfeld's terminology, "extractive interactivity"[253] (as represented by Duplo). Willis argues that smaller primitives "allows greater creative possibilities but can potentially create a more complex learning process"[254] due to their greater recombinant potentiality. If these primitives coalesce into a narrative (such as a deliberate sequence of words, images or sounds) then smaller primitives offer engagement with their more fragmentary narratives, while larger primitives facilitate semi-cogent narratives by being relatively less interactive.

Whitby's primitive –bricks– have relatively finite malleability (in contrast to sand or cement). This is at odds with artists' common composing with mutable forms, as they do not merely repackage existing structures like bricks or Lego but rather generate the "raw materials" (in Whitby's analogy)

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[252] Willis 2007:2.

[253] Peter Lunenfeld. 'Digital Dialectics: A Hybrid Theory of Computer Media.' *Afterimage* Volume 21. 1993. Cited in Willis 2006:4.

[254] Willis 2007:2.

and the rules and tools for their recombinant potentiality. This is illustrated via the analogy between creating Responsive Environments and cooking according to practitioner-theorist's algorithmic recipes for diverse ingredients. In a Responsive Environment composed of ingredients being Alphabet Soup, each primitive is a piece of pasta shaped as a letter. John Bird uses a similar approach, defining "primitive" as "a basic building block of a system that cannot be derived by combining other elements. A useful analogy is to see primitives as letters of an alphabet that can be combined in different ways to form words."[255] Dry letters are combined to spell words or sentences. If artists construct words and sentences that audiences re-arrange without being provided with a guiding principle or rationale, the artists effectively abrogate their authorial responsibility. To evoke participant responsibility to the physical environment of the artwork, recombinant potentiality is subject to constraints, within which artists communicate by engaging audiences through interactivity without the content being rendered 'meaningless.' This relates to Kaprow's Environment *Words*, with which this dissertation began. Kaprow defined the primitive as one word, so participants were requested not to chop words up into letters or to add individual letters that were not part of a phrase. He also instructed that words should only be written in chalk in the smaller room (which had chalk boards) and it was "inappropriate to staple word-strips askew"[256] in the larger room, composed entirely of words on cardboard strips. My approach to using interactivity without the content being rendered 'meaningless' employed two strategies which were used to create the artworks for this PhD. I termed them *Intact Syntax* and *Arpeggiated Hierarchy*. Both concern negotiating influence that engages audiences, while leaving the syntax

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[255] Bird 2004:45. With regard to *Eden*, one of McCormack's artworks that is discussed on p132 of the following chapter, Bird argues that *Eden* has "the *potential* to display 'combinatoric emergence'" whereby it "can explore the conceptual space defined by the primitives and the rules for combining them" however the limitations of the type of emergent behaviour that such a system can manifest were due to the fact that "the additional 'letters' were selected form a pre-specified, finite list and it is a matter of debate whether a computational system such as this can transform its underlying generative system in a way that is comparable to the creative emergence evident in biological evolution." Bird 2004:46-47.

[256] Kaprow in Reiss 1999:14.

of the work (including its words, sounds or images) relatively 'intact,' so responsibility may still be evoked via cogent engagement with the narratives.[257]

Within Interaction Design, *Intact Syntax* denotes the narrativity-interactivity trade-off whereby selected components which 'carry' the narrativity are non-malleable, while other components entertain greater plasticity. *Arpeggiated Hierarchy* concerns the hierarchy of consequence in determining what should be influenced and how. It denotes the form, whereby different 'layers' of media, such as words, sounds and images, are vertically overlayed as an arpeggio. Those 'carrying' the narrative are like the sustained bass notes that anchor contrapuntal music, such as Bach's solo organ compositions: they modulate infrequently since they carry the major harmonic shifts in the work (Figure 2-18). They may be likened to the building foundations in Whitby's analogy. Too much interactivity results in all layers of music (including the sustained bass notes) becoming structurally unsound as upper register notes rely on the solidity of the foundational bass notes to construct their harmonies. Arpeggios of brief high pitched notes become mutable and malleable without disrupting the greater narrativity of the work. They represent the primitives audiences may interact with while immutable base structures guide their engagement. Re-arranging sequences of higher pitched and shorter duration notes into varying permutations and combinations within the harmonic constraints of the existing music scale still produces quasi-palatable musical phraseology. However, modifying their scale and/or the sustained bass notes as composed by the artist may result in disharmony, symbolised by narrative disjuncture. The hierarchy of consequence in *Kali Yuga* and *Emergence* meant the playback and order of certain visual sequences were unalterable while more modular elements such as sound and tactility entertained greater real-time interactivity. These

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[257] The way *Intact Syntax* and *Arpeggiated Hierarchy* located a balance between the primitive size and its combinatoric potentiality was also informed by literary precedents, such as *Découpage* (the 'cut-up method'), the Surrealists' *Exquisite Corpse* and the French collective *Oulipo* which pioneered similar attempts, but in literature that was not designed for 'audience' interaction. An example of how I applied *Intact Syntax* and *Arpeggiated Hierarchy* to the domain of language was *TripleTriplet*, a sound collage that formed part of *StilmS*. The order of the triplet of words could be rearranged by participants, but due to the careful selection of words and their phonetic similarity, they 'made sense' in any permutation and combination of their arrangement. *TripleTriplet* is discussed on p219.

structures of limitations are further explained in returning to the linguistic analogy.

Figure 2-18: Excerpt from Johann Sebastian Bach *Art of the Fugue* (1745)

In applying *Intact Syntax* and *Arpeggiated Hierarchy* to words (symbolising a primitive in any medium), words and middle letters of words can be re-arranged, but the first and last letter of each word is in a fixed position. In this relationship between primitive size and interactive modality, the brain can still read sentences, such as the following from Hamlet:

> To be, or not to be: that is the qesoutin:
>
> Weehhtr 'tis nbelor in the mnid to suffer
>
> The snlgis and aowrrs of ougautores furntoe,
>
> Or to take amrs angisat a sea of tboulres,
>
> And by oopinpsg end them?[258]

The brain reads the first and last letters of each word, paying inconsequential attention to the order of the letters in-between. This opens hermetically sealed databases to participants' responsibility for exerting novel and unpredictable influences, by allowing variable levels of primitives (words and letters) and flexible recombinant potentiality that is subject to constraints (only middle letters can be re-arranged) which guide participants' interactivity. This represents the approach to evoking responsibility to the physical environment of the artwork by using recipes that (ideally) balance narrativity with interactivity. However in Responsive Environments the form of the letters themselves are also mutable, as artists seek to evoke responsibility to form as well as content.

In this Alphabet Soup, artists' responsibilities are raised when applying heat and liquid over time to deconstruct the letters so they may be cut, molded

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[258] *Stephen Sachs Blog*, Yale Law School. http://stevesachs.blogspot.com/2003_10_12_stevesachs_archive.html. Accessed March 17 2010.

or squeezed to make pliable and malleable shapes, or even a new 'alphabet.' Progressively deconstructing the primitives increases participants' responsibility to subsequently recombine such primitives free even from the strictures of language. At this level there is little, if any, guidance (or responsibility) maintained by the artists, as the primitives are at the behest of the audience. While some may enjoy this freedom, others may become disengaged or feel burdened by the responsibility to do anything with the putty they hold in their hands. Individual letters provide the comfort of communicating by forming words, but sacrifice the ability to make freeform abstract graphical constructions with the malleable form of the primitives. This represents the approach to evoking responsibility to the physical environment of the artwork by using recipes that sacrifice narrativity in favour of greater interactivity. Willis argues a "level of granularity" which uses "mere pixels, sound samples, words or letters…are therefore not narrative based, but instead focus on free-form creativity and play at the base level." He sees such "open interactions" as "promoting highly participatory creative experiences, rather than arranging heavily authored content into narrative-like structures."[259] The following considers the challenges toward evoking responsibility in such "open interactions," before concluding with the relatively 'closed' interactivity of narrative based approaches, as I found these to be the most appropriate approach in creating the artworks for this thesis.

2.3.1 Authority versus Control

> In fully interactive technologies, the flow of information goes both ways; the apparati become more like permeable membranes. If there is a balance of flow back and forth across this membrane, then the interactive technology is an intermingling of self and environment. If there is an imbalance, then the technology extends either outwards from the organic boundary of the interactor or inwards into the interactor.
>
> David Rokeby[260]

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[259] Willis 2007:2.

[260] Rokeby 1995b.

The next sentence in Willis' 'challenge scenario' that begins Section 2.3 above refers to Rokeby's same challenges in creating open flows across the "permeable membranes" between "self and environment" in Rokeby's *Very Nervous System*. While arguing for interactivity as being "about encounter rather than control,"[261] avoiding an "imbalance" in Rokeby's scenario hinges on balancing authority and control to allow participants sufficient responsibility to co-influence the work. This requires artists to "strike a balance" that prevents "the system from becoming closed" by trading sufficient authority for participants' control over the "responsive system's behaviour."[262] Graham's PhD survey of Interactive Art reached a similar conclusion that a "delicate balance between" artists' authority and participants' control was "one of the key skills of interactive art." She writes that audience control must be in "a delicate balance within the work" in relation to the work's "surprise, suspense, or chance" which requires "an absence of control."[263] Rokeby also locates the solution to artists' "common" and "apparent contradiction between the desire for control and the desire for surprises" being in their ability to "balance control and surprise to suit their 'interactive aesthetic.'"[264] Surprise becomes pivotal in determining the authority-control trade-off, as greater participant control denotes greater responsivity which increases artists' surprise at the less-predictable behaviour of participant and artwork.

This "apparent contradiction" regarding surprise is integral to Responsive Environments. Artists "desire for surprises" in artworks as well as audiences' behaviour reaches its apotheosis in the authority and control negotiated between artists, audiences and semi-autonomous Alife artworks. This refers to Burnham and Krueger's desired trajectory for Responsive Environments, as discussed above on p77. Rokeby posits these desires as determining any balance between control and authority in Alife art, with "the surprises that Krueger" seeks lying in "emergent properties" that offer "transcendence of the closed determinism implied by the technology and the

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[261] Rokeby 1995b.

[262] Rokeby 1995b.

[263] Beryl Graham. 'Playing with Yourself: Pleasure and Interactive Art.' In *Fractal Dreams*, edited by Jon Dovey. London: Lawrence and Wishart. 1996:171.

[264] Rokeby 1995b.

artist's own limitations."[265] That is, artists aim to engage audiences in artforms that behave unpredictably even with their creators. Rokeby situates this desire within "interactive artists all the way back to the 1960s" endeavouring to "create systems that surprise[d] them." A "loss of control" to the artwork as well as participants is central to "experiments in artificial life and artificial intelligence" which he decries "must transcend the control of the programmer"[266] as artists explore audience responsibilities toward semi-autonomous artworks. The following considers these conundrums for evoking environmental responsibility in the two principal approaches to Alife art: systematic and optical Alife art.

2.3.2 Alife versus Blife

> When we express our relationship to 'the natural' through poesis, explicitly or implicitly we express our concern about *control*. Nature is seen as a force that must be controlled, harnessed and tamed. This belief is reflected in popular notions of nature as 'the chaos', the uncontrollable force, and is exemplified by its effects and their consequences (death). For example, the act of gardening is often quoted as a metaphor to describe aesthetic selection. In some sense, gardening is about mastering the uncontrollable – harnessing nature and manipulating it for aesthetic purposes.
>
> Jon McCormack[267]

Alife art represents idealised "'art-as-it-could-be'"[268] through highly complex Alife science and technology, while Blife art denotes relatively simple analogue usages of nature, such as Environmental Art. As such, 'Nature' may be the subject of Blife art, while in Alife art it may be both subject (optical Alife

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[265] Rokeby 1995b.

[266] Rokeby in Simanowski 2003.

[267] Jon McCormack and Alan Dorin. 'Art, Emergence and the Computational Sublime.' In *Second Iteration: Proceedings of the Second International Conference on Generative Systems in the Electronic Arts*, edited by Alan Dorin. Melbourne: Centre for Electronic Media Art. 2001:3. Emphasis in original.

[268] Jon McCormack. 'Open Problems in Evolutionary Music and Art.' In *Lecture Notes in Computer Science, Volume 3449.* 2005.

art) and modus operandi (systematic Alife art).[269] While Blife and Alife art concern "harnessing nature and manipulating it for aesthetic purposes," as in McCormack's above quotation, the following discussion concerns their differences for evoking responsibility to the natural environment. This is illustrated by the centrality of control for evoking participants' responsibility to social and physical environments in Alife and Blife art. While Alife art "seeks to exploit the out-of-control nature of nature," McCormack is dubious about the ability of Alife artists to do "a very difficult thing," which is to "acknowledge that control must really be relinquished" to create such semi-autonomous art. The difficulty lies partly in McCormack's argument that "we humans live within a narrow band that tries to order chaos, but will not accept complete order."[270] Control is of necessity ceded to 'Nature' in Blife art, but such analogue forms do not permit cognisant interaction with human spatiotemporal dimensions, as discussed above in *FoAM's GroWorld* artworks.

Nature is not what it used to be: hence Richard Coyne's *Technoromanticism*, subtitled as *Digital Narrative, Holism and the Romance of the Real*. Coyne outlines the rationale of Alife, in "renouncing 'centralised thinking'…wherein emergent behaviours apparently challenge the need for centralised, hierarchical, and autocratic control structures, and artificial-life researchers devise computer systems to manifest evolution, growth, and holistic behaviour in artificial organisms."[271] In *The Darwin Machine: Artificial Life and Interactive Art*, Penny reasons why interactive artists appropriated Alife sciences as "an alternative to the current all too deterministic paradigm of interactivity as pre-set responses to user navigation through an ossified database."[272] He argues this saw the emergence a "new artform"[273] of biomimetic artworks based on models of "human behavior."[274] He argues there

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[269] This distinction holds, despite the fact that Alife art may also be about 'Nature.'

[270] McCormack and Dorin 2001:13.

[271] Richard Coyne. *Technoromanticism: Digital Narrative, Holism, and the Romance of the Real.* Massachusetts: MIT Press. 2001:3.

[272] Simon Penny. 'The Darwin Machine: Artificial Life and Interactive Art.' *New Formations* Volume 29. 1996. http://ace.uci.edu/penny/texts/darwinmachine.html. Accessed 16 April 2006.

[273] This also relates to "Behaviourist Art," which Roy Ascott coined in 1966 in his 'Behaviorist Art and the Cybernetic Vision.' *Journal of the International Association for Cybernetics.* Cybernetica IX, Volume 4.

[274] Penny 1995c.

are two principal Alife approaches in this "new artform": systematic and optical. Systematic Alife art "employ[s] 'nature' not as a representation but in the structure of the systems"[275] as "the dynamics of biological systems are modeled more than their appearance."[276] This approach prioritises form over content as Penny argues that "systematic" representation "is akin to the move from harnessing the products of biodiversity to harnessing the mechanism of biodiversity."[277] In contrast, optical Alife art prioritises intelligible content in representationalist depictions of artificial nature, generally being CGI animations of natural environments.

As the first monograph on Alife art, Whitelaw's *Metacreation: Art and Artificial Life* is unprecedented in its illustration of the intrinsic connections between Alife, emergence and environmental responsibility. Whitelaw positions aspirations toward "emergence and to the surprise, the excess, the 'something more' which that entails"[278] as central to Alife art. Emergence arises from insoluble interrelationships between causality and determinism. A multiplicity of interrelated interdependent parts produces a whole that "cannot be predicted"[279] as it is beyond the sum of its parts. Through this process, interactions produce a being that belies its process of becoming. Whitelaw argues emergence

> is at the core of both a-life science and a-life art practice. Emergence is the process by which complex systems seem to acquire new properties from one level of scale to another; centrally, how the complex interactions of matter at the microlevel give rise to life at the macrolevel.[280]

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[275] Penny 1996b.

[276] Penny 1995a. An example of systematic representation is Simon Penny and Bill Vorn's interactive robotic sculpture *Bedlam* (2001). In this vein Whitelaw places "Australian artist Rodney Berry [and] comments that his work 'fosters an interest in an aesthetic of systems and processes, rather than objects and images,' and links this aesthetic to a changed appreciation of nature, one which is ultimately expansive and ecological. Similarly, Jon McCormack remarks that experience with Alife processes triggers 'a wider appreciation of natural systems.'" Rodney and McCormack in Mitchell Whitelaw. 'The Abstract Organism: Towards a Prehistory for A-Life Art.' *Leonardo* Volume 34(4). 2001:345.

[277] Penny 1996b.

[278] Whitelaw 2004:22.

[279] McCormack and Dorin 2001:12.

[280] Whitelaw 2004:22.

Ceding control and gaining surprise are primary motivations for emergent behaviour in art, as these "complex lifelike behaviours are not directly controlled or specified; rather they arise spontaneously from microscale interactions."[281] The Inside-Outside relationship is highlighted through such artforms, as they evoke "a sense of the processes of nature in machines."[282] However this raises the issue of whether this relationship is perceptible, given the following conundrum.

Emergence is fundamental to understanding environmental responsibility in semi-autonomous self-perpetuating artworks manifesting synthesised or simulated evolution and adaptation. Via biomimicry, participants' responsibility to the social and physical environment is designed to evoke their responsibility to natural environments optically and/or systematically represented in the artwork. Furthermore, participants become environmental stewards, responsible for diverse immediate-through-cumulative long-term influences on the artworks' evolution. This occurs through the form of using a "process which is authored or established by the artist, and which primarily operates independently of the author" once participants start exerting cumulative influences from interacting with the artwork. Responsibility in such artforms is negotiated between the artist's establishment of the genotype "instructions" or "axioms" or "rules about interactions" and participants' responsibility for influencing the phenotype forms of the "work as it is experienced by a viewer."[283] However this invokes an intractable dilemma. Cumulative causality holds considerable scope for engendering participants' responsibility to current and future states of an artwork. The challenge lies in how to communicate participants' awareness of their responsibility for their immediate, collective and cumulative influences. While this is discussed in the practice of the corpus in Chapter 3, the following explores what I termed 'The Limitation of Imitation': being the ability of

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[281] Whitelaw 2004:207.

[282] McCormack and Dorin 2001:12.

[283] Jon McCormack. 'Evolving for the Audience'. *International Journal of Design Computing.* Volume 4. Sydney: University of Sydney Press. 2002. www.csse.monash.edu.au/ejonmc/projects/edenijcd/edenijcd.html. Accessed March 12 2006.

biomimesis to evoke responsibility to natural environments in either systematic or optical Alife art.

2.3.2.1 The Limitation of Imitation

> Nature can be seen as a complex system that can be loosely transferred to the process of design, with the hope that human poiesis may somehow obtain the elements of physis so revered in the design world. Mimicry of natural processes with a view to emulation, while possibly sufficient for novel design, does not alone necessarily translate as effective methodology for art however.
>
> Jon McCormack[284]

Optical and systematic Alife art prioritise the imitation (or "emulation" in McCormack's terminology above) of evolutionary and emergent process, to the detriment of cogent narrativity. This is not a criticism against Alife practice, as this is a conscious decision undertaken by such practitioners. Systematic Alife art is highly appropriate for exploring qualities like causality, complexity and malleability, although concomitantly indeterminate cause-effect correlations obscure participants' responsibility to the physical environment of the artwork, as they are less likely to understand what they influence and how. As causality and determinism relate to all Responsive Environments the following pertains to optical Alife art.

With its intrinsic Inside-Outside relationships, Alife art appears to be highly suited for evoking participants' responsibility to the natural environment. However canonical works of optical Alife art excessively prioritise visualising emergent processes over audience engagement with the processes. Karl Sim's *Genetic Images* (1993) was one of the first of this ilk. Similar to McCormack's *Turbulence*,[285] *Genetic Images* involved pre-animated sequences of artificially evolved 'creatures' that participants affected in a literal adaptation of Darwinian natural selection. 'Voting' to continue a hereditary trait involved participants selecting a "'parent' image by running over and

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[284] McCormack and Dorin 2001:6.

[285] This work is discussed in the case study on McCormack on p129.

stomping on the pad beneath its display."[286] This selection mechanism and causal relationship was not self-critical or self-reflexive. In nature (represented by the evolving creatures on screen), stomping kills a creature, rather than assisting its reproductive process. If the work symbolised taxidermic appropriation of nature, stomping/'killing' is an apt metaphor for the desire to preserve an image of a wild/dangerous animal in a benign pose for human appreciation, like a stuffed tiger in a hunter's trophy case. Instead, stomping 'assisted' the creatures, as "the selected image instantly breeds 16 similar but slightly variant offspring, and these appear on the monitors for the next round of choosing."[287]

Genetic Images highlights how content and Interaction Design co-determine an evocation of participants' responsibility to the natural environment by way of their responsibility to the physical environment of the artwork. This becomes even more pronounced in two key members of Huhtamo's 'old school': Christa Sommerer and Laurent Mignonneau. Whitelaw terms their works "interactive environments" and "immersive environments" in which "human participants negotiate with the emergent behaviour of artificial agents" wherein "emergence is behavioral and interactive."[288] This denotes a Responsive Environment of "artificial ecosystems (or 'cybernatures') …concerned with the dynamics of interaction and the construction of a whole, living space."[289] Their *Interactive Plant Growing* (1992), *A-volve* (1994-5), *Trans Plant* (1995-6) and *Eau de Jardin* (2004) appear fertile for evoking environmental responsibility through their "basic cybernatural disjunction" between the "play of inside and outside, and of nature and its simulation." While works such as *A-volve* that "unequivocally evoke nature appear in a computational medium" Whitelaw argues that "these elements –technology and nature, medium and content– are brought together in an analogical relationship"[290] in such a way as to undermine an evocation of participants' responsibility to the natural environment. This is examined in their canonical

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[286] Kelly 1994.

[287] Kelly 1994.

[288] Whitelaw 2004:216.

[289] Whitelaw 2004:64.

[290] Whitelaw 2004:78.

Interactive Plant Growing, as it initiated the ethically problematic vein their subsequent works continue in.

Interactive Plant Growing includes five different real plants on plinths surrounding a video projection (Figures 2-19, 2-20, 2-21). The electrostatic charge of the human body is registered and measured as the hands of participants approach or touch the plants. Nuances of these charges are computationally analysed to control artificially evolved computer animations of 'virtual' plants projected onto the screen in the middle of the real plants. Taking heed of Whitelaw's advice that "learning to control the virtual plants involves establishing a gestural and tactile relationship with a real plant"[291] I explored the range of responses to diverse interfacing with the work during a week at ZKM Centre for Art+Media. While Sommerer and Mignonneau claim that "by producing a sensitive interaction with the real plants, the viewers too become part of the installation" as "they decide how this interaction is translated to the screen and how growth takes place on the screen," I found only direct, deterministic, repeatable causality in all my variations of being gentle and rough in my one-on-one and many-to-many interaction and when just observing others' interaction. Despite their claims for variable consequences of nuanced interactivity, the work evoked 'nature' as submissive, predictable and controllable. In light of this, it appears troubling that they declare

> all variations ultimately depend on the viewers sensibility to find the different
> levels of approximation distances, as they are responsible for the different events
> in growing. Since it takes some time for the viewer to discover the different levels
> for modulating and building the virtual plants, he will develop a higher sensitivity
> and awareness for real plants.[292]

Such rhetoric does not match reality, which they do not comment on, of the inevitably detrimental effect of human contact (such as tearing and rubbing of leaves, disturbing the soil microorganisms and leaving oil residue from rubbing the plants). One possible reading from evoking such ambiguous responsibility is that to behave 'responsibly' in the manner encouraged by the

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[291] Whitelaw 2004:65.

[292] Christa Sommerer and Laurent Mignonneau. '*Interactive Plant Growing*: An Interactive Computer Installation.' *Christa Sommerer and Laurent Mignonneau's Website.* 1992. www.interface.ufg.ac.at/christa-laurent/works/ frames/frameset.html. Accessed March 12 2006.

Figures 2-19, 2-20, 2-21: *Interactive Plant Growing* (1992) (re-iterated in 2004 as *Eau de Jardin*)

artists (that is, making physical contact with the plants to trigger the computer animations) occasions 'irresponsible' behaviour toward the natural environment (of the plants within the artwork). Armstrong argues that such problematic responsibility stems from their use of Alife, which is not "intended to offer up any new insights on our failure to understand the implications of our mass disturbances to our own ecosystems (or indeed our ecosystems in interaction with post-human, post-natural forms)" as he finds they are "rather concerned with a simple praxis of simulation."[293]

Whitelaw argues attitudes toward nature evoked by such Alife art have disturbing consequences for evoking environmental responsibility, both to the physical environment of the artwork and the natural environment evoked by the artwork. He maintains the "celebration of interactive engagement" in their "artificial natures…acquires a twist" from their Alife art not being "interrogated for what it omits or implies" as they "adopt it uncritically." This arises since works such as *A-volve* "signify a nature organised around human presence and agency" that consequently "evoke[s] a questionable analogy between biological and computational structures and, in the process, reinforce an anthropocentric notion of nature, not intentionally but as a consequence of their representational forms."[294]

In critically analysing these issues from the standpoint of *Narratives of Artificial Life*, Katherine Hayles approaches Alife art as 'stories' told by the work's and their creators' rhetoric surrounding them. She finds the

> long jump from programs that replicate inside a computer to living organisms…is
> bridged largely through narratives about the programs that map them into

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[293] Armstrong 2002:263.

[294] Whitelaw 2004:80-1.

> evolutionary scenarios traditionally associated with the behaviour of living creatures.[295]

This culminates in the "high drama of a Darwinian struggle for survival and reproduction"[296] that these works represent. Like Whitelaw, she finds the environmentalist concerns of Alife artists' are problematically evoked in Alife art. As an example, the evolutionary biologist Thomas Ray advocated his Alife program *Tierra* "be released onto the internet so that it could 'breed' diverse species on computers all over the world" while he simultaneously devised a biodiversity conservation plan for Costa Rican rainforests. While "Ray saw the two proposals as complementary," for Hayles "their juxtaposition dramatically illustrates the reconstruction of nature going on in the field of artificial life."[297]

Having considered issues in evoking environmental responsibility in optical Alife art, the following section considers the related trade-off between determinacy and indeterminacy as they relate predominantly to systemic Alife art.

2.3.3 Determinacy versus Indeterminacy

> Where there is no perceptible correlation between the input gesture and the resulting sonic outcome, the feel of the system being interactive can be lost, as the relationship between input and response is unclear. It is a balancing act to maintain both a sense of connectedness between input and response while also maintaining a sense of independence and freedom.
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> John Drummond[298]

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[295] Hayles 1996:147.

[296] Hayles 1996:148.

[297] Hayles 1996:146. Other examples include McCormack on being in Litchfield National Park as the inspiration for his artwork *Eden* (as discussed on p132), Char Davies statement on her website that "in addition to her artistic and technological research in virtual environments, Davies cares for 400 acres of land in rural Quebec, the 'real' environment that is the source of inspiration for much of her work." (www.immersence.com), and Brenda Laurel's statement on her website that her "Personal Interests and Activities" include being "active in multiple organizations devoted to environmentalism and human rights" and "playing in nature: hiking, camping, snorkelling." www.tauzero.com/brenda_laurel/resume/bl_cv_04-06.htm. Accessed April 28 2006.

[298] Jon Drummond. *Interactive Electroacoustics*. PhD Dissertation. School of Communication Arts, University of Western Sydney. 2007:119.

The preceding optical Alife approaches use relatively deterministic causality to facilitate participant engagement with the complex phenomena of emergence and evolution. In contrast, systematic Alife artists, such as Penny, Bill Vorn and Louis-Philippe Demers have more leeway to balance determinacy and indeterminacy as their works have no narrative agenda to uphold. Like Drummond's above "balancing act," Penny's relatively indeterminate causality progressively inculcates participants' awareness of the influences of their behaviour according to "the degree to which the changes in output are interpreted by the user as related to their behaviour." To do so, he advocates interactivity that requires a "learning curve" where "the user must be trained or the system must teach the user"[299] to interact in more complex ways. He places this high in his priority of strategies, as "a central issue in interactive art is managing the learning curve of the user." While he finds this "is a key measure of the success of any interactive system,"[300] it is not viable for works with many-to-many interactivity, where it is highly problematic for participants to interpret which changes are attributable to whose actions even with simple interactivity. Furthermore, in his rationale simplistic 1:1 causality would be 'successful,' even though this would not engage participants' interest according to his argument that "the designer must successfully communicate that the user is having a controlling effect on the system and at the same time engage the ongoing interest of the user with enough mystery."[301]

Creating an appropriate amount of "mystery" hinges on balancing determinate and indeterminate causality between audience and artwork. This raises an intractable challenge for creating Responsive Environments: causality in natural environments is inexorably complex. Biomimetically employing such complex causality undermines attendees' ability to behave responsibly. Rokeby argues "we begin to behave irresponsibly" including "paying little attention to the results of our actions" as he finds it unreasonable to "be expected to act

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[299] Simon Penny. 'Agents as Artworks: Agent Design as Artistic Practice.' In *Human Cognition and Social Agent Technology*, edited by Kerstin Dautenhahn, 395-414. Philadelphia: John Benjamins Publishing Company. 2000. http://ace.uci.edu/ penny/texts/agentdesign.html. Accessed 16 April 2006.

[300] Penny 2000.

[301] Penny 2000.

responsibly if I don't know what is going to happen"[302] as the result of his actions. Using acid rain as his example of when "weather" becomes "interactive," Rokeby proposes the 'balance challenge' as being to reconcile that "absolute prediction and control of very complex situations is not possible, and partial control often disastrous" with his edict that "we must learn to accept this fact without abdicating from the responsibility for the results of our actions." He proposes the Inside-Outside relationship for this intractable problem, whereby "refining awareness of the ways in which we affect our physical and metaphysical environments is the only way to avoid increasing the apparently chaotic and cataclysmic behaviour of the universe."[303] Refining such awareness of the affects of our actions hinges on balancing simplicity and complexity, as this binary is inextricably related to positioning an artwork between determinacy and indeterminacy.

2.3.4 Simplex: Between Simplicity and Complexity

> While simple interaction may be accessible to a wider range of users, such interaction inherently produces more specific results from the interaction... Ultimately more complex interaction allows the user greater creative possibilities, but at the expense of creating a more complex learning process for the user. Interactivity relies heavily on the balance between these two properties.
>
> Karl Willis[304]

The 2006 AE symposium I attended, *Simplicity: The Art of Complexity*, explored these realms as ideas and ideals, without mentioning simplicity or complexity in the form or Interaction Design of interactive art. In Responsive Environments these tropes are applied literally in "finding an appropriate balance between the difficulty of the interaction and the resulting complexity of the piece"[305] as both extremes impede an evocation of audience

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[302] David Rokeby. 'Predicting the Weather.' *Musicworks* Volume 33. 1985. http://homepage.mac.com/davidrokeby/weather.html. Accessed March 12 2006.

[303] Rokeby 1985b. This is explored in Rokeby's practice in Section 3.4.

[304] Willis 2006:17.

[305] Willis 2006:17.

responsibility. This quote from Willis refers to the centrality of balance as his guiding principle in negotiating all binaries. In his *Light Tracer* (2005), which I interacted with in 2005, his 'solution' was optional layers of interactivity stemming from simple and intuitive 'drawing' on a screen by the light of a torch left (Figures 2-22, 2-23). Video cameras periodically incorporated still images of participants onto the screens, so participants could interact with one another by such acts as drawing over the projected images of their co-participants. *Light Tracer* balances simplicity and complexity, as participants experience the instant feedback from 'just drawing' and/or explore the multi-faceted interactions produced by the variable degradation of the lines of light and projected stills of participants. Through 'levels' of interactivity, *Light Tracer* offers differing degrees of engagement for those "seeking deeper contact."[306]

Figures 2-22, 2-23: Karl Willis *Light Tracer* (2005). Photography by Karl Willis.

For overly complex works, Willis finds those "frustrated by the difficulty of the interaction will soon give up." His "sweet spot" between these extremes is "where the user can interact fluidly without their attention being drawn to the difficulty of the interaction or the limited possibilities it offers."[307] This 'sweet spot' hinges on the work managing Penny's "learning curve,"[308] discussed above in relation to the determinacy–indeterminacy trade-off. Of the "two undesirables" of overly simplistic or complex works, Penny rejects the "solution" of making "a work…so simple in the dynamics of interaction that it

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[306] Erkki Huhtamo. 'Seeking Deeper Contact Interactive Art as Metacommentary.' *Convergence: The International Journal of Research into New Media Technologies.* Volume 1(2). 1995:100.

[307] Willis 2006:17.

[308] Penny 2000.

is easy to understand," since he equates this with being "immediately boring." However, as simple interactivity is concomitantly intuitive, it may facilitate experiencing the content rather than the means of engaging. While Willis also finds participants become "bored by limited possibilities of interaction," this depends on the prioritisation of interactivity as modus operandi or subject of a work itself. Penny rejects works at the other extreme that are "so complex that the average user cannot discern the way in which they are controlling or effecting the events." Rokeby's solution to this conundrum is to 'streamline' participants' influence as "it is difficult to sense interaction in situations in which one is simultaneously affecting all of the parameters."[309] This is not based on imposing control, but rather his experience that "interaction within a system that does not impose significant constraints is usually unsatisfying to the interactor" as "limiting the options available at any one time…assists the interactor in deciding how to proceed." Rokeby arrives at such a rationale for simplifying interactivity within the complex causality of his work, as he finds

> the interactor's sense of personal impact on an interactive system grows, up to a
> point, as his or her freedom to affect the system is increasingly limited. The
> constraints provide a frame of reference, a context, within which interaction can
> be perceived…by relinquishing a relatively small amount of control, an interactive
> artist can give interactors the impression that they have much more freedom than
> they actually do.[310]

While the above strategies were highly influential in my approaches of *Intact Syntax* and *Arpeggiated Hierarchy*, my work differs from the artists cited above in evoking participants' responsibility primarily through the final binary of interactivity-narrativity. This stems from the above artists' relative disinterest in narrative based approaches, over their prioritisation of complexity and/or Alife.[311] The concluding binary is discussed in three practitioner-theorists who also prioritise balancing the binary of narrativity-interactivity over balancing the other binaries.

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[309] Rokeby 1995a:140.

[310] Rokeby 1995a:141.

[311] As Rokeby says: "fixed narrative is great for story telling, but I am not really interested in story telling." Rokeby in Simanowski 2003.

2.3.5 Narrativity versus Interactivity

If humanity were a building, each author would be a window. The view from that
window would be the picture each author paints.

Mark Meadows[312]

Meadows sees narrativity as the composite aggregations of perspectives from each window of each picture painted by each author. Rejecting the idea that the multiple perspectives of many authors standing at their windows are solipsistic, Meadows maintains narratives are the means by which our respective perspectives coalesce to give shape to the building. In *Pause & Effect: The Art of Interactive Narrative* he traces narrativity across millennia and the various media by which such stories are made and shared. In Interactive Art, trade-offs exist between the ability of narratives to engage and immerse audiences and the "pause and effect" when participants interact with narratives. Interactivity jeopardises the evocation of participants' responsibility to the physical environment of the artwork when it impedes engagement by rupturing narratives, so much so that Cameron argues an "interactive narrative" is "a contradiction." He maintains that the "narrative form appears fundamentally non-interactive," as by introducing interactivity the "authority of the narrator is dispersed among the readers, and…the idea of cinema, or of literature, merges with that of the game, or of sport."[313] Similarly, Dinkla introduces the term "'floating work of art'" in *The Art of Narrative - Towards the Floating Work of Art*, to account for how the "dynamic and fluctuating narrative material" is no longer "created by the process of narration by the author, but only in the interaction with the reader."[314] One 'solution' advocated by the following practitioner-theorists, which I also used in *Kali Yuga* and *StilmS*, is to devise narrative content and form which are amenable to rupture and reconfiguration, via Freudian dream interpretation.

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[312] Mark Meadows. *Pause and Effect: The Art of Interactive Narrative.* New York: New Riders Press. 2002.

[313] Andrew Cameron. 'The Future of an Illusion: Interactive Cinema.' *Millennium Film Journal* Volume 28. 1995:3. http://mfj-online.org/journalpages/mfj28/acintro.html. Accessed March 12 2006.

[314] Söke Dinkla. 'The Art of Narrative - Towards the Floating Work of Art.' In *New Screen Media: Cinema/Art/Narrative,* edited by Martin Rieser and Andrea Zapp. London: British Film Institute. 2002:33.

Riika Pelo has explored this balancing act as a novelist who creates interactive artworks with discontinuous narratives. In *Caesura in 'Marina's Garden': Interactive Narrative as a Drama of Responsibility and Interruption* she argues "we can think of writing a narrative as interface design."[315] She approached the conundrum of combining interactivity with narrativity by incorporating caesura into the content and form of her artwork *Marina's Garden*. In desiring to "set up an ethical interface in the Levinasian sense…in which the visitor becomes responsible for the Other…within her temporality, her past and present times" Pelo invoked a non-linear and recombinant narrative structure that drew upon "Freud's metaphor of the *Wunderblock*."[316] For this work, narrative was "only possible through the logics of dreaming and remembering"[317] by harnessing the reconfigurability of non-sequential non linear modular narrative fragments according to Freudian dream analysis. For his earlier explorations in negotiating the narrativity-interactivity trade-off, Weinbren's *Sonata* (1991-3) used a similar Freudian approach to dispel illusions of sequential narratives, to facilitate interaction with a narrative that embraced caesura and interruption.

Seaman also employs Freud's *The Interpretation of Dreams* for the narrative structure used in his *The World Generator* (Figures 2-24, 2-25, 2-26). Narrativity in this organicist work emerges from participants' real-time activation of myriad audiovisual primitives through indeterminate permutation and combination. Seaman uses organicism in its artistic context of a holistic narrative composed of modular segments inextricably interconnected to one another. The work straddled narrativity and interactivity as Seaman designed it "to strike a balance between order and chaos,"[318] with the immutable form and content of the primitives being recombined by participants into narrative segments. Due to their size and possibilities for real-time recombinations, he argues this narrative framework produces "inter-authorship"[319] between audience and artwork, although does not indicate whether this can evoke
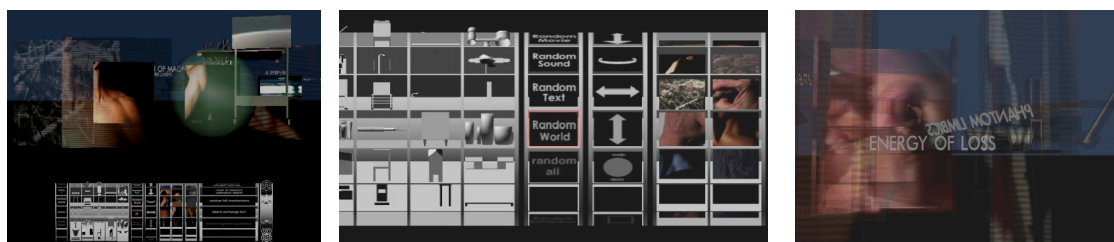
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[315] Pelo 2004:17.

[316] Pelo 2004:19.

[317] Pelo 2004:16.

[318] Seaman 2002:72.

[319] Seaman 2002:237.

'inter-responsibility.' While his PBR PhD explores issues of "Environmental Engagement,"[320] "Environmental Relations,"[321] and "behavioral responsiveness"[322] in creating his Responsive Environment it does not discuss such relations in terms of responsibility.

Figures 2-24, 2-25, 2-26: Interface for Bill Seaman *The World Generator* (1996-97)

2.4 Summary

This chapter has identified and clarified the recipes and ingredients for creating Responsive Environments. It has situated them from the Outside -that is analysis via the broader art historical and cultural frameworks within which they exist– and then from the Inside –that is analysis of practitioner-theorists' attempts to balance binaries within and between one another to create Responsive Environments. In combination, these Outside and Inside perspectives have created a portrait of Responsive Environments according to their heterogeneous artforms, media and disciplines that they incorporate. Accounting for their historical background has demonstrated how they relate to eclectic artforms and to attempts to explore relationships between art, science and technology.

The discussion of artists and artworks in this chapter has illustrated novel contributions to attempting to balance authority-control, determinacy-indeterminacy, simplicity-complexity and narrativity-interactivity in creating Responsive Environments. Specific facets of the practice of the artists in this

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[320] Seaman 2002:79.

[321] Seaman 2002:97.

[322] Seaman 2002:237.

chapter combine to form a multi-faceted but intentionally fragmentary picture of Responsive Environments. Each facet and fragment was detached from the 'big picture' for the purposes of illustrating the role of different recipes in combining the ingredients used in creating Responsive Environments. Returning to Whitby's analogy that began this chapter, if Responsive Environments are "a finished construction" or "a built house," this chapter has disaggregated them into "a load of bricks,"[323] so that each brick may be examined in more detail than is possible when embedded in the labyrinthine maze of bricks that constitute a built house.

Discussing them ingredient-by-ingredient, or brick-by-brick, illustrates how they are potentially suited to evoking environmental responsibility. In turn, the case studies in the following chapter collectively explore their ingredients artist-by-artist, to illustrate shared trends and approaches amongst related practitioners of Responsive Environments. Considering their ingredients in their totality over the career trajectory of the five artists/collectives in Chapter 3 complements the approach taken in this chapter, whereby having disaggregated Responsive Environments into their ingredients and primitives, the following aggregates them into their true form as *gesamtkunstwerk*.

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[323] Whitby in Cameron 1995.