

Development and Evaluation of Participant-Centred Biofeedback Artworks

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George Poonkhin Khut

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Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in full or in part, for a degree at this or any other institution.

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Abstract

This exegesis details the development of four interactive artworks that enable audiences to observe and reflect on aspects of their own psychophysiology, using the technologies of biofeedback interaction as a way of situating the participant's subjectivity and bodily experiences within each other as reciprocal phenomena.

The central theme addressed through these works concerns the representation and experience of subjectivity as a physiologically embodied phenomenon. Although contemporary theories of psychophysiology and phenomenology have overturned the idea of mind-body separation, many forms of cultural practice continue to represent subjectivity as a fundamentally disembodied phenomenon. In addition, bodily experience in contemporary culture is framed almost entirely in terms of narrowly defined and commodity driven notions of sexuality and desirability, or even pathology. Such representations and experiences perpetuate feelings of mistrust and hostility towards the body, in ways that inhibit our ability to fully engage with the world as fully humans. This problematic use and representation of the body in contemporary culture has attracted the attention of many artists and theorists over the past fifty years, generating a diverse body of works celebrating and sometimes questioning the embodied subject as a medium for enquiry and aesthetic enrichment.

The artworks documented in this exegesis extend this process of re-examination through the use of interactive bio-sensing technologies and audience participation. Interactive practices reframe subjectivity as a fundamentally active process, shifting our sense of involvement in the issues at hand from one of detached onlookers to active participants. Each of the works creates a space where participants and observers alike can become present to aspects of body-mind process. Audience responses to these works have been studied as a way of evaluating the extent to which these interests have been realised through interaction and this exegesis contributes to an emerging but growing body of research into the use of audience experience as a tool for designing and evaluating interactive artworks.

Dedication

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Table of Contents

Chapter 1 Introduction	1
1.1 Methodology: Art practice as research.....	3
1.2 Structural Overview.....	5
1.3 Background and Personal Motivations.....	6
Chapter 2 Conceptual Framework	9
2.1 The Somatic Perspective	11
2.1.1 Somatic Bodywork Methodology	12
2.1.2 Somatics, Phenomenology and Aesthetic Experience.....	14
2.1.3 Implications.....	15
2.2 Biofeedback.....	17
2.2.1 Definition and Implications for Interactive Art.....	18
2.2.2 Summary: Biofeedback.....	21
2.3 Pragmatist Aesthetics	22
2.3.1 Deweyan Naturalism.....	22
2.3.2 The Work of Art: The work that art does	23
2.3.3 Art and Everyday Life: A non-dualistic continuity.....	24
2.3.4 Implications.....	25
2.4 Somaesthetics	26
2.4.1 Analytical Somaesthetics	28
2.4.2 Pragmatic Somaesthetics.....	28
2.4.3 Practical Somaesthetics	29
2.4.4 Implications.....	30
2.5 Experience-centered Design	31
2.5.1 Developing a Model of Experience in Interaction	31
2.5.1.1 Influences on Experience.....	32
2.5.1.2 Qualities of User Experience in Interaction	33
2.5.1.3 The Dynamics of user experience in interaction.....	34
2.5.2 Applications for Biofeedback Artworks.....	35
2.6 ‘Transforming Mirrors’ in Interactive Art	37
2.7 Summary: Conceptual framework	39

Chapter 3	Context & Precedents	41
3.1	Participatory Art Practices	43
3.1.1	Participation and the 'Art/Life' Problem	43
3.1.2	Dialogical Practices	45
3.1.3	Rirkrit Tiravanija	46
3.1.4	Lee Mingwei	48
3.2	Sensorial Interventions	50
3.2.1	James Turrell	50
3.2.1.1	Spiritual References in Perception-based Works	52
3.2.1.2	Art, Technology and Perception	52
3.2.2	Lygia Clark	54
3.2.2.1	Art, Transformation and Healing: A shamanic aesthetic?	55
3.3	Interactive Art as Mediated Reflection	57
3.3.1	Fels, Mase and Reiners: <i>Iamascope</i>	57
3.3.2	John Tonkin: <i>Elective Physiognomies</i>	58
3.3.3	<i>Transforming Mirrors</i> and Biofeedback Interaction	60
3.4	Physiologically-responsive Artworks	62
3.4.1	Amplified Bodies	64
3.4.1.1	Alvin Lucier: <i>Music for Solo Performer</i>	64
3.4.1.2	Seiko Mikami: <i>World, Membrane and the Dismembered Body</i>	66
3.4.1.3	Bio-amplification is Not Always Biofeedback	66
3.5	Navigable Environments	68
3.5.1.1	Char Davies: <i>Osmose</i>	68
	Navigating Otherness or Sensing an Inner Process?	69
3.6	Attention Dependant Systems: Brainwave Biofeedback	70
3.6.1	David Rosenboom: <i>Vancouver Piece</i>	70
3.6.2	Mariko Mori: <i>Wave UFO</i>	71
3.6.3	Social Bodies: Multi-user physiological interactions	73
3.6.4	Group Participation in Interactive Art	75
3.7	Summary: Context and precedents	76
Chapter 4	The Body as Interface	78
4.1	The Heart as Interface	81
4.1.1	Heart rate Variability Spectrum Analysis	82
4.1.2	Heart Rate Sensing Hardware	84
4.1.3	Breath as Interface	86
4.1.4	Breath Sensing Hardware	87

Chapter 5	The Installations	89
5.1	<i>res'onance-body [-box]</i>	91
5.1.1	Introduction	93
5.1.2	Aims and Developmental Context	96
5.1.3	Design and Implementation	98
5.1.4	Data Mapping	99
5.1.5	Technical Developments	101
5.1.5.1	Breath Sensing and Analysis	101
5.1.5.2	Heart Rate Sensing and Analysis	103
5.1.5.3	Visual Aesthetics	103
5.1.6	Audience Response and Interaction Analysis	104
5.1.7	Evaluation	106
5.1.8	Implications	107
5.2	<i>Cardiomorphologies v. 1</i>	108
5.2.1	Introduction	110
5.2.2	Aims and Developmental Context	113
5.2.3	Design and Implementation	114
5.2.3.1	Data Mapping	115
5.2.4	Technical Developments	117
5.2.4.1	Hardware	117
5.2.4.2	Software	118
	Heart Rate Analysis: Data Processing with 'Wavewares'	118
	Breath Analysis Using Sensor Displacement Velocity	119
	Logarithmic Data Mapping	121
	Heart Rate Sonification: Steps, waves and latencies	122
5.2.5	Interaction Analysis and Audience Response	125
5.2.5.1	The Participant Interviews	126
5.2.5.2	Methodology	126
5.2.5.3	Participant Responses	127
5.2.6	Evaluation	129
5.2.7	Implications	130
5.3	<i>Drawing Breath (versions 1 & 2)</i>	132
5.3.1	Introduction	134
5.3.2	Aims and Developmental Context	136
5.3.3	Design and Implementation	137
5.3.4	Technical developments	139
5.3.4.1	Breath Sensor Hardware	139
5.3.5	Interaction Analysis and Audience Response	141
5.3.6	Evaluation	142

5.3.7	Implications.....	143
5.4	<i>Cardiomorphologies v.2</i>	144
5.4.1	Introduction.....	146
5.4.2	Aims and Developmental Context	148
5.4.3	Collaborating with curator Lizzie Muller	148
5.4.4	Collaborating with Greg Turner: ‘Data Toys’	151
5.4.5	Designing with Audience Experience	154
5.4.5.1	Video-cued-recall Interview Method	154
5.4.5.2	Working with Peers and <i>Experiential Goals</i>	157
5.4.5.3	Experience-centered Design with <i>Personas and Scenarios</i>	158
5.4.5.4	Technical implementation: drawing it all together.....	165
5.4.5.5	<i>Cardiomorphologies v. 2</i> at Beta_space Gallery	166
5.4.6	Interaction analysis and audience response	171
5.4.7	Evaluation.....	173
Chapter 6	Conclusions	176
6.1	An Internally Focused Interaction	180
6.2	Facilitating Enquiry Through Interaction	181
6.2.1	Immersion, reflection, ambiguity and enquiry.....	183
6.2.2	Ambiguity and audience agency	184
6.2.3	Forlizzi and Battarbee’s Model of Experience in Interaction	185
6.3	Acknowledging The Role of Co-experience	187
Chapter 7	Future Directions	189
7.1	Beyond Research and Development.....	190
7.2	Consolidating Methods and Tools.....	190
7.3	Wider Applications	191
7.3.1	Art and Health.....	192
References		192

LIST OF FIGURES

Figure 1	Sullivan’s Framework for Visual Arts Research	4
Figure 2	Diagram of conceptual framework	9
Figure 3	Diagram of influences on experience	32
Figure 4	Diagram of the dynamics of experience in interaction	36
Figure 5	Rirkrit Tiravanija: <i>Untitled</i> (installations views).....	47
Figure 6	Lee Mingwei: <i>The Letter Writing Project</i> (installation view)	48
Figure 7	James Turrell: <i>Danae</i> (installation view).....	51
Figure 8	Lygia Clark: <i>Dialogue</i> and <i>Baba Antropofágica</i> (participatory objects and events)	54
Figure 9	Lygia Clark: <i>Relational Objects</i> (therapeutic interventions)	56
Figure 10	Sydney Fels, Kenji Mase and Dirk Reiners: <i>Iamascope</i> (interactive video installation).....	57
Figure 11	John Tonkin: <i>Elective Physiognomies</i> (web-based interactive artwork).....	59
Figure 12	Justine Cooper: <i>Tulp</i> (installation views)	61
Figure 13	Alvin Lucier: <i>Music for Solo Performer</i> (performance).....	65
Figure 14	Seiko Mikami: <i>World, membrane and the dismembered body</i> (bio-acoustic sound installation).....	65
Figure 15	Char Davies: <i>Osmose</i> (screen image).....	68
Figure 16	Char Davies: <i>Osmose</i> (installation view and screen image).....	69
Figure 17	Mariko Mori: <i>Wave UFO</i> (installation views).....	71
Figure 18	Mariko Mori: <i>Pure Land</i> (digital print).....	72
Figure 19	Thecla Schiphorst & Susan Kozel: <i>Whisper</i> (interactive artwork).....	73
Figure 20	Christa Sommerer & Laurent Mignonneau: <i>Mobile Feelings II</i> (interactive artwork)	74
Figure 21	Time series graph showing variations in heart rate over time	81
Figure 22	Time series graphs of heart rate variations, accompanied by FFT spectrum analysis	83
Figure 23	Three heart rate sensors.....	85
Figure 24	Diagram illustrating the involvement of the ribs and diaphragm in the action of breathing	87
Figure 25	Airflow spirometer (breath sensor)	88
Figure 26	<i>res'onance-body [box]</i> installation views	92

Figure 27	<i>res'onance-body [-box]</i> installation plan view.....	95
Figure 28	Richard Misrach: <i>Untitled</i> (photographic print) and James Turrell: <i>Wide Cut</i> installation view.....	97
Figure 29	Data flowchart for <i>res'onance-body [-box]</i>	99
Figure 30	Data flowchart for <i>res'onance-body [-box]</i> : breath and heart rate sonifications.....	100
Figure 31	Comparison of breath sensor data from different interactions.....	102
Figure 32	<i>Cardiomorphologies v.1</i> installation views.....	109
Figure 33	<i>Cardiomorphologies v. 1</i> installation plan view	112
Figure 34	Data flowchart overview for <i>Cardiomorphologies v. 1</i>	115
Figure 35	<i>Cardiomorphologies v. 1</i> final data visualization scheme.....	117
Figure 36	Obtaining breath rate from velocity data	119
Figure 37	Data flowchart (sensor analysis) for <i>Cardiomorphologies v. 1</i>	120
Figure 38	Logarithmic scaling with Klaus Filip's <i>ll.log</i> object for MAX-MSP	121
Figure 39	Time series graph of heart rate data showing delay between original impulse and smoothed signal	122
Figure 40	Data flowchart (heart rate sonifications) for <i>Cardiomorphologies v. 1</i>	123
Figure 41	Data flowchart (breath sonification) for <i>Cardiomorphologies v. 1</i> with off-set resonant band-pass filter banks.....	124
Figure 42	<i>Drawing Breath v.2</i> installation views	133
Figure 43	<i>Drawing Breath v.2</i> installation plan view.....	135
Figure 44	<i>Drawing Breath v.2</i> (still image sequence from video documentation).....	137
Figure 45	Data flowchart (sonification) for <i>Drawing Breath v.2</i>	138
Figure 46	Instructional diagram for <i>Drawing Breath v.2</i>	140
Figure 47	<i>Cardiomorphologies v. 2</i> final data visualization scheme	145
Figure 48	<i>Cardiomorphologies v. 2</i> participant and exhibition attendant.....	147
Figure 49	Five test-visualisations developed for <i>Cardiomorphologies v. 2</i> using Greg Turner's initial data visualization system.....	152
Figure 50	<i>Cardiomorphologies v. 2</i> prototype imagery exploring halo-like forms as basis for data visualisation.....	164
Figure 51	Details of the Max-MSP data mapping system devised in collaboration with Greg Turner, for <i>Cardiomorphologies v. 2</i>	165
Figure 52	<i>Cardiomorphologies v.2</i> installation plan view.....	168
Figure 53	Video still sequence from <i>Cardiomorphologies v. 2</i> as exhibited at the Powerhouse Museum, Beta_space gallery	169

Figure 54	<i>Cardiomorphologies v. 2</i> installation views, as installed at the Powerhouse Museum, Beta_space gallery	170
Figure 55	Family groups engaged with <i>Cardiomorphologies v. 2</i> , at Inbetween Time: Festival of live art and intrigue, Arnolfini, Bristol, UK, 2006	173
Figure 56	Visitors observing a young participant in <i>Cardiomorphologies v.2</i> , at Inbetween Time: Festival of live art and intrigue, Arnolfini, Bristol, UK, 2006	188

LIST OF TABLES

Table 1	Sympathetic and parasympathetic autonomic nervous system responses correlating to specific patterns of engagement between subject and environment (Recordati, 2003).....	79
Table 2	Autonomically mediated changes in visceral activity, showing the contrasting influences of the sympathetic and parasympathetic nervous systems. Adapted from Tortora and Gabrowski (1993) and Gilbert & Moss (2003).	80
Table 3	Audio and visual data-mapping scheme used in <i>Cardiomorphologies v.1</i>	116
Table 4	Lizzie Muller’s experience-centred process for making and curating interactive art	150

TABLE OF APENDICES

Appendix A	DVD #1 Portfolio of exhibited works 2003–2005 (inside back cover)	205
Appendix B	DVD #2 Video-cued retrospective reports recorded by Lizzie Muller (inside back cover).....	206
Appendix C	Curriculum Vitae	207
Appendix D	<i>res'onance-body [-box]</i> Promotional Material.....	208
Appendix E	<i>Cardiomorphologies v. 1</i> Promotional Material	210
Appendix F	<i>Cardiomorphologies v. 1</i> Information Sheets (UWS HREC)	212
Appendix G	<i>Cardiomorphologies v. 1</i> Participation Release Form (UWS HREC)	214
Appendix H	<i>Cardiomorphologies v.1</i> Interview Information Sheet (UWS HREC).....	215
Appendix I	<i>Cardiomorphologies v.1</i> Interview Release Form (UWS HREC).....	216
Appendix J	<i>Drawing Breath</i> – Song Company Promotional Material.....	217
Appendix K	<i>Drawing Breath v.2 – Open Letter</i> Promotional Material.....	218
Appendix L	<i>Cardiomorphologies v. 2</i> – Beta_space gallery Promotional Material,.....	219
Appendix M	<i>Cardiomorphologies v. 2</i> Visitor Information Card (side A and B)	220
Appendix N	<i>Cardiomorphologies v. 2</i> Information Sheet (UWS HREC)	221
Appendix O	<i>Cardiomorphologies v. 2</i> Interview Release Form (UTS HREC).....	223
Appendix P	<i>Cardiomorphologies v. 2</i> Video-Cued Recall Interview Transcripts	224
Appendix Q	Interview with Kate Richards, RealTime, Issue 66	241
Appendix R	<i>Cardiomorphologies v. 2</i> Promotional Material, Arnolfini, 2006	244
Appendix S	Exhibition Information Sheet, <i>This Secret Location</i> , Arnolfini, 2006.....	245
Appendix T	<i>Cardiomorphologies v. 2</i> Review by Tim Atack, RealTime, Issue 72	248
Appendix U	Catalogue Essay for <i>Strange Attractors</i> exhibition, by Lizzie Muller.....	249

Chapter 1 Introduction

Today, we are in the situation of looking for a new paradigm for the mind-body relationship. In this regard, it is appropriate that we acknowledge the new movements in holistic and psychosomatic medicine, which undertake the research in depth-psychology (particularly biofeedback). These empirical scientific movements have a tendency to lean towards a new dualism presupposing the correlativity of mind and body, in place of the Cartesian dualism which separates them. It is encouraging for those of us who have been nurtured within the Eastern cultural tradition that Eastern medicine and traditional meditational methods have now come to be re-evaluated alongside these aforementioned movements. Here we can sense a potential movement which will demand a thorough reflection upon Western attitudes, unchanged in philosophy and empirical science since Descartes.

– Yuasa Yasuo, (1989)

Twentieth-century Western sciences have overturned traditional Enlightenment assumptions regarding the relationship between mind and body, demonstrating numerous ways in which cognitive and physiological processes can be seen as inseparable from one another (Damasio, 1994, Gallagher, 1995). This understanding of consciousness as a physiologically embodied phenomena is opening the way for a far reaching re-evaluation of the way we conceive mind and body in contemporary society (Yasuo, 1989). Despite the near universal rejection of Cartesian dualism as a theory of mind and body, subjectivity continues to be represented in contemporary media and popular culture as some form of mysteriously disembodied ethereal spirit, peering out onto the world from behind our eyes. This sense of disembodiment finds its most recent expression in the notion of a post-corporeal virtual consciousness proposed by such cyber-cultural theorists as Jaron Lanier (Richardson and Harper, 1996).

The central problem addressed in this exegesis is: how can contemporary fine arts practice evolve new ways of facilitating and representing experiences of subjectivity (and by inference, the self) as a physiologically embodied phenomena? While many artists and theorists have explored the idea of embodied subjectivity through representations, personal accounts and propositions (Hartoum, 1994, Lucier, 1976,

Hall, 1992, Bourgeois and Weiermair, 1995), my interest in this exegesis is in how audience experience itself can be developed as a medium *and* focus for aesthetic enquiry. If as Merleau-Ponty (1962) suggests, *the body is our medium for having a world*, then this exegesis explores the potential of this medium as both a subject and vehicle for aesthetic enquiry and enrichment, using the technologies of biofeedback training.

Biofeedback training is a process of electronically monitoring moment-to-moment changes in a subject's internal behaviour and feeding these changes back to the subject (i.e. 'feedback') in such a way that the subject can learn to consciously influence the behaviour being observed. The artworks documented in this exegesis use biofeedback training to enable subjects to sense and then initiate subjectively mediated changes in their own breath and heart rate patterns, as revealed to them through a physiologically responsive audio-visual artwork.

The aesthetic developed through the four works documented in Chapter 5 is an aesthetic of self-sensing, self-moving and self-knowing. However, the works themselves are presented in the context of public exhibitions – a highly social setting – and it is this context that enables audiences to be with each other in ways seldom afforded in normal social life. The work provides a space where people can be present in a sustained and highly focused manner, not just to the quiet rhythms of their own interior, but also to the interiors of their companions and the interiors of total strangers. The function of the witness and the sharing of intimate experiences amongst friends and strangers is an important component of how people experience art in social settings, and is one of the factors that serves to distinguish these artworks from their related experiences in clinical biofeedback and body-mind training practices such as yoga, Feldenkrais Method or Alexander Technique. These works are not claimed as art simply because they are situated in art galleries. Rather, they are presented in art galleries because these settings can offer a supportive space for having and sharing experiences outside the usual body-focused contexts of pathology, crisis, sexual attraction and competitive sport. While these contexts can and often do provide us with valuable and transforming life-experiences and knowledge, the more subtle, intimate and quiet of these experiences usually takes place behind closed doors and outside of public forums. Art exhibitions are special in this respect, because they provide a safe space for testing out new, unfamiliar or difficult subjectivities in a setting that is both intimate and social at the same time.

Another related strand addressed by the works documented in this exegesis and their presentation in public places is the fact that we usually only ever become aware of our bodies when something breaks down – we become ill in some way, or fail to conform to social conceptions of what a desirable body should look like. Our experience of the body at a personal level is thus framed almost entirely by notions of pathology, alienation and function/dysfunction. The works documented in this exegesis

introduce the possibility of less pathologically-determined relationship to body experience, and a way of attending to the body as an instrument for pleasure, self-cultivation and insight. Focusing specifically on individual experiences of heart and breath functioning, the works facilitate an experience of the body as something we *are*, in contrast to the more prevailing notion of the body as something we *have*. HCI (Human-Computer-Interaction¹) and experience-centred design approaches are explored in Chapter 5.4 (*Cardiomorphologies v. 2*) as a way of examining the range of conditions afforded by the design of each of the works, and these methods have been used to develop a more detailed understanding of how the works help shape participants' experience of themselves and the kinds of behaviours that they can and cannot afford.

1.1 Methodology: Art practice as research

The methods used in the development of this practice-based exegesis and its related body of works draw on a multiplicity of dialogues, methods, contexts and practices. In *Art Practice as Research*, Graeme Sullivan (2005) terms this approach as *Visual Arts Knowing* and uses it to differentiate creative arts research processes from those of both logical positivism and qualitative research:

Visual Arts Knowing [sic] situates the imaginative and intellectual process that describes the way artists think as they make use of a cognitive coalition of ongoing dialogue between, within, and around the self, artworks, viewers, and settings, where each is used to help create new understandings. This dynamic and reflexive meaning making is described as 'transcognition', and it captures the movement and purposeful searching of the artistic mind. Seen within the context of research, the alignments and areas of emphasis that artists search out take in the perspectives of 'others', be they other artists, theorists, art writers, artworks, viewers, or contexts, and this ensemble provides a structure for referencing and reviewing.

(Sullivan, 2005)

Rather than working through a predetermined proposition or design problem, this exegesis documents an iterative process in which the various strands of discourse, practice and critical enquiry surrounding our experience and representation of the body and human-computer interactions are unravelled and re-integrated within successive artworks and their associated critical evaluations. Sullivan describes this process as a braid-like structure in which a multiplicity of tightly bundled strands undergo a processes of unravelling, critical sorting/editing and re-braiding, by which

¹ HCI is a field of design research and information technology concerned with the study and development of interactions between humans and computational systems.

new ‘ropes’ of ‘visual arts knowing’ become woven from existing stands of discourse, practice, inquiry and critique.

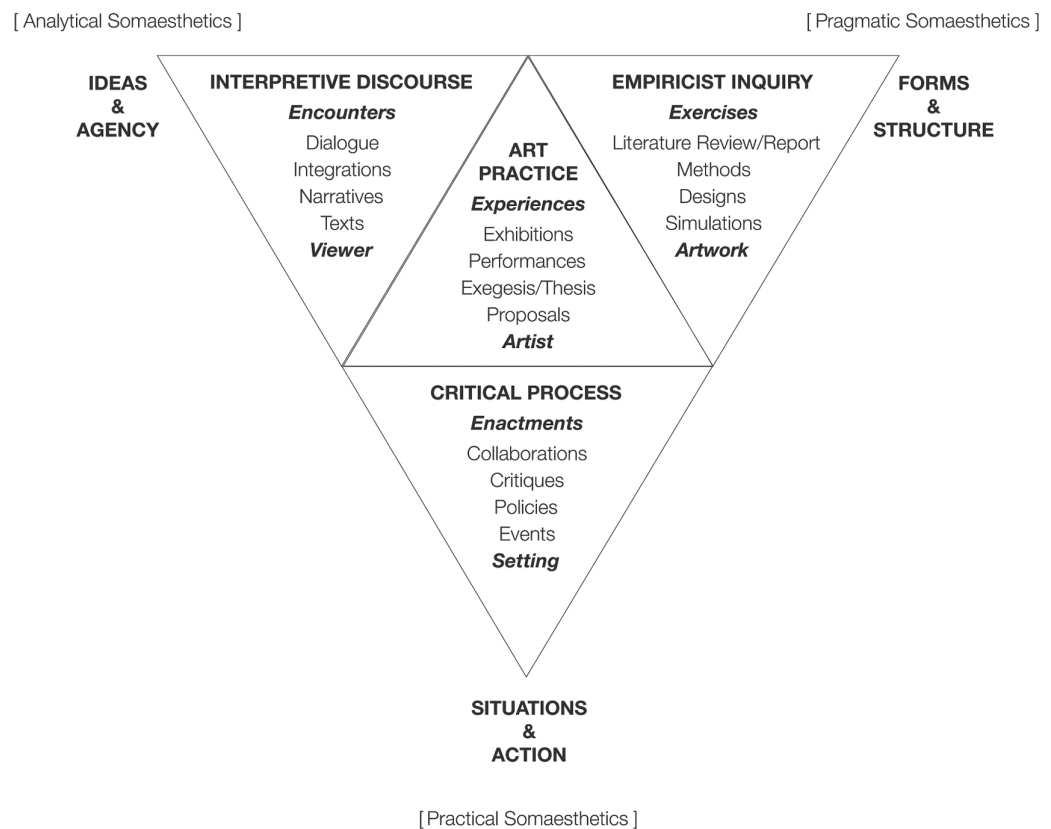


Figure 1 Graeme Sullivan's *Framework for Visual Arts Research Projects* (2005) describing the four primary bundles that constitute the larger 'braid' from which creative arts research process create new knowledge and cultural practices: art practice; interpretive discourse; empiricist inquiry and critical processes.

1.2 Structural Overview

The multiple strands of action and enquiry described by Sullivan in his *Framework for Visual Arts Research* are established in chapters 2 and 3 of this exegesis. Chapter 2 introduces the methodological frameworks that have helped guide this exploration of biofeedback interaction as a vehicle for body-mind practice and representation. A number of the approaches described in this chapter are drawn from non-arts related disciplines, but all share an interest in human subjectivity and action as a richly embodied phenomena situated across multiple dimensions of physical, psychological, and environmental interaction.

Chapter 3 outlines key art practices that have informed the development of the works documented in this exegesis, focusing on issues surrounding audience experience, interaction, perception and body-mind processes. In addition to the precedents established by other artists working in areas of bodily interaction and electronic media, this chapter explores art practices that engage audiences through processes of direct inter-personal exchange and conviviality. The inclusion of these 'low tech' practices provides a context for analysing the important relational and dialogical aspects that have evolved through each of the artworks documented later in Chapter 5.

Chapter 4 introduces the core principals of human psychophysiology that form the basis of the human-computer interactions explored in this exegesis. Unconventional modes of interaction based on processes of differentiation and the voluntary entrainment of externally focused 'fight-flight' responses and internally focussed 'rest-digest' response patterns render subjectivity and the process of being as fundamentally active and organizing processes. Emotionally mediated changes in heart rate variability patterning are introduced as a safe and symbolically rich modality for the exploration of body-mind and environmental interactions explored in the two principal artworks documented in Chapter 5: *Cardiomorphologies v. 1* and *Cardiomorphologies v. 2*.

Chapter 5 details the development of the four interactive artworks that comprise the practical component of this exegesis, describing the development of the conceptual, aesthetic and technical structures that have informed each of these works along with a consideration of the audience experiences and behaviours these works afforded. In different ways, each work documented in this chapter draws together the various strands of discourse, practice, inquiry and critique introduced in Chapter 2 and 3, documenting the evolution of my own understanding of the issues surround the use of biofeedback interaction and physiological sensing.

Key understandings emerging from this evaluation form the basis of the concluding Chapter 6, followed by a consideration of future directions suggested by this exegesis in Chapter 7.

1.3 Background and Personal Motivations

The research process I have presented here began several years ago as a general yearning for a form of experience that would engage audiences at a more physically intense level than prevailing trigger-based interactions or the point-and-click interface of CD-ROMs. The increasing presence of computer mediated interactions in both work and recreational spheres has provoked a growing sense of frustration for many artists and designers with the overwhelmingly impoverished physicality of the standard (mouse and keyboard) computational interfaces provided to their users (Rokeby, 1998). At the same time, a growing interest in the role of the body and various forms of physically-intense interactions and experiences has been made possible with the wider accessibility of bio-sensing and interaction-design technologies. During the 1990's, theories of 'the body' gained widespread interest in contemporary arts practice and criticism, with artists such as Kiki Smith, Helen Chadwick, Marina Abramovic, Stelarc and Orlan, developing works that invoked or represented the body and its processes as a site of contesting ideologies, contradictory desires and utopian/dystopian fantasies. Science fiction culture was (and continues to be) saturated with 'cyborg' imagery and fantasies of downloadable consciousness: the mind's final emancipation from the vulnerabilities of flesh.

Up to 2001, my own practice as an artist had, for the most part, focussed on creating quiet, meditative installation environments, often using electronically manipulated sound recordings to invoke trance-like states of reverie and synaesthesia. In my installation *Pillowsongs*, presented in various configurations between 1997 and 2000, audiences rested on specially prepared beds in a darkened installation space, listening to shifting constellations of environmental recordings, droning audio textures and distant radio-transmissions. Resting horizontally on these bed structures for up to forty-five minutes at a time, audiences would drift towards a state of lucid-dreaming, listening to sounds reproduced through speakers implanted underneath the pillows on which they rested. I was fascinated by the response of audiences who engaged with the work and especially by the intensely personal nature of the 'sounds and shapes inside my head' experience they reported, due in no small part to the sleep-like physical re-orientation the work demanded. This process of actively engaging with the terms and conditions by which audiences themselves engage with the work, became the starting point for my investigations into the psychophysiological dimensions of aesthetic experience. This initially led to an investigation into so-called subliminal communication techniques (*Nightshift* installation with Wendy McPhee, 2001-2003), and then to brainwave entrainment and biofeedback explorations with psychologist Dana Adam in 2001.

What attracted me to these unusual forms of physical interaction (listening on beds, subliminal audio-visual cues, brainwave entrainment, etc) was the way they

transformed our experience of the world and our experience of being within it by altering the conditions of our being, both physically and subjectively. Biofeedback interactions enable participants to consciously influence aspects of their own physiology (i.e. brain wave patterns, heart rate, nervous system processes, etc), in ways that invite a profound re-assessment of the long-held Western ontology of mind and body separation. Instead of the distant observer acting upon a passive physical substance (their body and the 'dead matter' of the world), biofeedback and psychophysiology present us with an experience of conscious engagement of psychological and physiological processes: the self is not separate from the physiological behaviours it seeks to influence, but rather is continuous with it. Indeed, as anyone who has experienced biofeedback interaction for themselves can attest, conventional habits of exerting coercive mental effort as a means of affecting change actually impede one's ability to influence many physiological processes i.e. alpha, theta and SMR brain-waves; along with heart rate, sweat gland activity, etc. In this sense the research undertaken here inevitably involved the negotiation of various theories of ontology, of how we are in the world, and the nature and extent of our being. A detailed philosophical and sociological investigation into the transformation of Western ontologies is obviously beyond the scope of this essentially practice-based creative arts research exegesis. However, this issue of ontology introduces three theoretical perspectives that have come to form the conceptual and critical framework used in the ongoing development and evaluation of the works presented in this exegesis:

- The *somatic* body-work methodologies embodied in the work of such writers and practitioners as Dan Hanlon Johnson, Moshe Feldenkrais, Thomas Hanna and Dean Juhan (Hanlon-Johnson, 1995a) and Richard Shusterman, exploring the body as a subjectivity;
- John Dewey's *Pragmatist Aesthetics*, (1958) with its instrumental notion of the work that art does, and the important role of the audience in the development of cultural practices, understandings, and values; and,
- Interactive art practices, as defined by David Rokeby's notion of the interactive artwork as a *Transforming Mirror* (Rokeby, 1995) and as a model for understanding and evaluating interactive art works that engage participants in mirror-like processes of self-reflection, observation, and correlation.

All three approaches emphasize the instrumental role of first-person audience/subject and use systems-oriented methodologies to describe and develop relationships between the self and the world/other. My relationship to the theories and practices contained

within this framework have evolved over the course of my research: from a series of vague, enthusiasms towards a more detailed appreciation of each of the fields involved. The following chapter provides an overview of these key research influences; delineating the scope of my interests and aims, and providing a framework from which to critically evaluate the works developed in this exegesis.